**Attorney Docket No. 2556/006**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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|---|---|---|
| Group Art Unit 2173 | : | |
| | : | PATENT APPLICATION |
| Examiner D. Bonshock | : | |
| | : | |
| In re application of | : | **VISUAL DISPLAY OF ROOM** |
| | : | **INFORMATION** |
| GENE E. NACEY | : | |
| | : | |
| Serial No.: 10/005,985 | : | |
| | : | |
| Filed: November 12, 2001 | : | |

Pittsburgh, Pennsylvania 15222
January 17, 2010

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

# APPEAL BRIEF

Applicants submit the following Appeal Brief in response to the Final Office Action of August 17, 2009 ("Office Action"), which finally rejected claims 1-37 if the above-referenced application. Applicants timely filed a Notice of Appeal on November 17, 2009.

## I. Real Party in Interest

The real party in interest is Tele-Tracking Technologies, Inc, which is a Delaware corporation with a principal place of business of 226 Fourth Ave., Pittsburgh, PA 15222. Tele-Tracking Technologies, Inc. is the assignee of the above-referenced patent application.

## II. Related Appeals and Interferences

There are no appeals or interferences related to this application.

## III. Status of Claims

Claims 1-37 are currently pending in this application and all stand rejected.

## IV. Status of Amendments

All amendments presented in the case have been entered.

## V. Summary of the Claimed Subject Matter

### A. Brief Summary

The invention is an apparatus for simultaneously graphically displaying room and occupant information. The claimed apparatus comprises cells which may be viewed on the display. Each cell simultaneously conveys both room status information and occupant status information. The cell further comprises a plurality of pre-set and user-defined modifiable attributes. In addition the invention is a method for graphically displaying the room and occupant information comprising: displaying a matrix with at

least one cell with modifiable attributes and modifying the attributes of the cell in conveying information about the room or occupant status of the room. Finally, the invention is a program storage device that may perform the steps of graphically displaying information regarding a room and any occupants. The steps comprise displaying a matrix with at least one cell with modifiable attributes and modifying the attributes of the cell while conveying information about the room and occupant status of the room.

### B. Direct Mapping of Independent Claim Elements to Specification

A direct mapping of the elements of the independent claims to the specification is as follows:

1. (Rejected) An apparatus for the graphical display of room and room occupant information, said apparatus comprising:

a display (*Support can be found throughout the Specification, specifically, Figs. 1-4; page 14, lines 8-14*); and

an arrangement for producing a cell for being viewed on said display (*Specification, page 6, line 6 to page 7, line 10; page 9, lines 1-8*), said cell simultaneously conveying room status information regarding said room and status information regarding any registered occupant of said room (*Specification, page 7, lines 4-10; page 9, lines 9-16; page 13, line 7*).

13. (Rejected) An apparatus for the graphical display of room and room occupant information, said apparatus comprising:

a display (*Specification, Figs. 1-4; page 14, lines 8-14*);

an arrangement for producing a cell for being viewed on said display (*Specification, page 6, line 6 to page 7, line 10; page 9, lines 1-8*), said cell having a plurality of modifiable attributes (*Specification, page 4, lines 10-17; page 8, lines 10-17*); and

a controller which modifies at least one of the attributes of said cell (*Specification, page 4, lines 12-13)* in simultaneously conveying information about the current status of said room and any registered occupants of said room (*Specification, page 7, lines 4-10; page 9, lines 9-16; page 13, line 7*), wherein said attributes include both pre-set and user-defined attributes that comprise pre-set and user-defined attribute values (*Specification, page 7, line 11 to page 8, line 2; page 8, lines 10-17; page 10, lines 8-16*).

25. (Rejected) A method of graphically displaying room and room occupant information, said method comprising the steps of:

displaying a matrix (*Specification, page 3, lines 14-15; page 4, line 15; Figs. 1-4*);

displaying at least one cell within the matrix (*Specification, page 4, line 16*), each cell corresponding to and simultaneously displaying information relating to said room and any registered occupants of said room (*Specification, page 4, lines 15-17; page 7,*

*lines 4-10; page 9, lines 9-16; page 13, line 7*), said cell having a plurality of modifiable attributes (*Specification, page 4, lines 10-17; page 8, lines 10-17*); and

modifying at least one of the attributes of the cell in conveying information about at least one of the current status of said room and the current status of any registered occupants of said room, wherein said attributes include both pre-set and user-defined attributes that comprise pre-set and user-defined attribute values (*Specification, page 4, lines 17-18; page 7, line 11 to page 8, line 2; page 8, lines 10-17; page 10, lines 8-16*).

37. (Rejected) A program storage device readable by machine (*Specification, page 5, lines 1-2*), tangibly embodying a program of instructions executable by the machine to perform method steps for the simultaneous graphical display of information relating to a room and any registered occupants thereof (*Specification, page 5, lines 1-4*), said method comprising the steps of:

displaying a matrix (*Specification, page 3, lines 14-15; page 4, line 15; Figs. 1-4*);

displaying at least one cell within the matrix (*Specification, page 4, line 16*), each cell corresponding to and simultaneously displaying information relating to said room and any of said registered occupants of said room and having a plurality of modifiable attributes (*Specification, page 4, lines 15-17; page 7, lines 4-10; page 9, lines 9-16; page 13, line 7*); and

modifying at least one of the attributes of the cell in conveying information about the current status of said room, wherein said attributes include both pre-set and user-

defined attributes that comprise pre-set and user-defined attribute values (*Specification, page 4, lines 17-18*; *page 7, line 11 to page 8, line 2; page 8, lines 10-17; page 10, lines 8-16*).

## VI. Grounds of Rejection to Be Reviewed on Appeal

Applicants present the following concise statement of each of the grounds of rejection presented for review:

**A. Whether claims 1-37 are obvious under 35 U.S.C. §103(a) over Kuban *et al.*, U.S. Patent No. 4,994,908, in view of Crawford, U.S. Patent No. 5,331,549 and Khalessi et al., U.S. Patent No. 6,633,900.**

Applicants respectfully submit that the above statements of the grounds of rejection is "no".

## VII. Argument

### A. The Invention is Not Obvious Under 35 U.S.C. 103(a) Over the Combination of Kuban *et al.*, Crawford and Khalessi *et al.*, Therefore the Rejection of Claims 1 - 37 Should Be Reversed.

Independent claims 1, 13, 25 and 37 are argued together. The board in its discretion may choose one of the claims to decide the appeal.

The present invention contemplates a method whereby room status information, for example hospital room status information and occupant status information are simultaneously visually displayed, thereby aiding staff in visualizing and comprehending this information at a glance. In accordance with one embodiment, the invention utilizes the capabilities of a computer to graphically display selected information in a manner

which conveys the information to staff, such as hospital staff, in a form which aids in display and comprehension of the information. Specifically, the information is preferably conveyed for multiple units through the use of a matrix format. For example, information for multiple patient care units, such as critical care, intensive care, maternity, etc. may be displayed. A cell is used to represent each room in a unit being displayed. Components of the cell indicate key considerations for every department. For example, the cell contains information regarding status of the rooms, such as the number of rooms available, the number of assigned beds, the room number, the status of the upkeep of the room and the type of bed in the room. The cell also contains status information regarding the status of the occupant of the room, such as the absence or presence of the occupant, the name of the occupant or other identifying information, the gender of the room occupant, and the admission, transfer or discharge status of the occupant. Additional information may also be displayed by clicking a component of a cell.

Kuban is entirely directed to the tracking and display of room information using a cable television system. *Kuban, Abstract.* This includes occupancy and status information such as room temperature. There is no teaching or suggestion in Kuban directed to providing any additional status information relating to anything other than the room itself. Furthermore, the Examiner concedes that Kuban fails to teach simultaneously conveying room and occupant status information as previously discussed in prior submissions. *See*, Office Action dated August 17, 2009 paragraph 6, page 3 ("Crawford teaches a system for monitoring remote systems (see abstract) but further teaches simultaneously displaying patient status information and room status information in a common cell (see column 6, lines 3-27 and figures 3 and 4)").

Crawford discloses the tracking and display of physiological status information. While the system does contemplate providing this information in a graphical format which may reference the room in which the patient is located on a floor, there is no teaching or suggestion of integrating the physiological information with any room status information.

According to the Office Action in response to Applicant's prior arguments (see passage quoted above), the Examiner states that Crawford teaches the simultaneous display of patient and room status information in a common cell, relying on Col. 6, lines 3-27 and Figs. 3 and 4 of Crawford. *See*, Office Action dated August 17, 2009 paragraph 6, page 3. The Examiner states that Crawford displays multicolor coded alert conditions. The Examiner reads broadly on the term "status of the room" as required by the claims and relies upon a disclosure of the location of the room as fitting within this status. Lastly, the Examiner states that the description in Crawford of a color coded alert indicating a disconnected monitor is an indication of the room status, such as if the patient has left the room. *Id.* at paragraph 6, page 4.

Applicant respectfully disagrees with the Examiner's characterization. The claims require simultaneous display of both room and patient status. The combination of Kuban, Crawford and Khalessi not disclose or suggest the same. The independent claims now require that the cell conveys "room status" information. *See* Amendment and Response filed May 15, 2009. Room status information is clearly defined on pages 7 and 8 of the application, as referring to the variable conditions associated with the room and *not* the room's location or any other permanent attribute of the physical space

encompassing the room. As such, the room location cannot be identified as room status as defined by the claims in light of the specification.

With respect to the Examiner's characterization of the color coded warning lights of the Crawford system (see Office Action dated July 17, 2009, paragraph 6, page 4), the mere absence of a warning light, or a warning light which is merely reflective of a disconnected vital signs monitor cannot be considered as a teaching or suggestion of room status. The absence of an indicator conveys absolutely nothing about the room, only that no information is presently known. The room could be occupied or unoccupied, clean or dirty. The purpose of the system is to convey real time status information and the claims are therefore drawn to require the simultaneous display of such information. Reference to an indicator which lacks any output as indicating an empty room is improper, as that conclusion cannot be accurately drawn. Furthermore, the disconnection of monitoring equipment in the room from an occupant, such as identified in the Examiner's example of a patient that has gone for a CAT scan, is an insufficient teaching or suggestion of a room status monitor. The presence of a disconnected status light or other indicator merely discloses that such equipment is not in use. Certainly the patient could still be present in the room while such equipment is not in use, as the same equipment may not have been prescribed or required by the patient's attending physician. Thus the patient may be present and the disconnected status would not accurately reflect the room status. It is therefore submitted that the claims, as currently amended, require simultaneous display of both room and patient status (and not merely the absence of such status) and Kuban/Crawford does not disclose or suggest the same.

The Examiner has provided no response regarding Applicants' most recent arguments or amendments to the claims, as summarized above and submitted in the Amendment and Response filed May 15, 2009. Instead, the Examiner exactly reiterated all previous rejections under 35 U.S.C. §103(a) over Kuban and Crawford and added a third reference, Khalessi *et al.*, to the rejection. *See* Office Action dated August 17, 2009, paragraph 6.

Khalessi teaches an automated management information system and methods for work order assignment and field communication. *Col. 1, lines 11-14.* Specifically, the system allows for the assignment, communication and management of work orders with mobile field units. The system comprises a computing network with an application program through which a work order may be assigned and managed. The work orders are transmitted via a local area network and a TCP/IP network to a mobile filed unit with a computing device. *Abstract.*

Khalessi further describes a monitor server software program which accepts updates from applications indicating that a work order has been assigned. This software also accepts updates as to whether the work order was received at the field unit and whether it was accepted by the field crew. The monitor server also provides a report generation feature. *Col. 6, lines 32-40.* A work order is assigned to a filed crew using an application program. The field unit may request additional information. *Col. 6, line 58 - Col. 7, line 13.*

The Examiner cites to col. 10, lines 26-67 and Figure 11 of Khalessi as teaching "a system in which both human information and location information are conveyed" and "the combination of human status information and location status information within one

cell." *See*, Office Action dated August 17, 2009, paragraph 6, page 4. Figure 11 and the cited passage describe how assignment data is retrieved by the system. A field crew member clicks on an "assignment link" located on the computing device. A detailed assignment page is generated utilizing information entered by the field crew. Figure 11 illustrates a "Crew Assignment Detail Form." This form indicates the *status of the current assignment*, such as location of the work assignment, the type of service problem reported at the site, and the status of the work assignment, such as "Enroute", "Completed", "Rejected", etc. The Examiner equates the existence of "location information", *i.e.*, the location of the field crew as described in Khalessi, with "room status information", as claimed in the present invention. This comparison is inappropriate. As described above, and as detailed by Applicants in the Response and Amendment dated May 15, 2009, "room status" information *does not include or contemplate the location of the room.* The mere indication of the location of a field crew cannot be considered as a teaching or suggestion of room status. In addition, there is no description in Khalessi of any *room* about which information will be conveyed. There is therefore no teaching of a cell conveying room status information, as no "room" or "room status" information is ever contemplated or taught.

In addition, Khalessi contains is no teaching of a registered occupant of a room, as required by the present claims, nor is any status information regarding such an occupant generated. The system of Khalessi simply reports information regarding the *status of the current work assignment*, and never contemplates occupant status information. The teachings of Khalessi are completely inapplicable to the present invention.

The claims in their current form require the tracking and simultaneous display of both room and occupant related information. It would not be obvious to combine the Kuban, Crawford and Khalessi references to arrive at the claimed invention, except through the use of improper hindsight. The Crawford reference is directed to physiological information relating to the medical status of a patient. The Kuban reference is related to administrative or operational conditions of the room. The Khalessi reference is related to the management of work order assignments and field communications. It would not be useful or appropriate to combine the medical/physiological information of Crawford with the administrative information of Kuban and the off-site work order tracking system of Khalessi as no person in a hospital setting would likely be interested in all three types of information. Medical information is of interest to the doctors and treating personnel. The room status information is of interest to housekeeping, admissions and food service, for example. The off-site work order tracking system is of interest to businesses providing repair or other types of services, such as a utility provider. The medical staff and repair crews have no interest in bed occupancy or cleanliness state of the room, while admissions is not likely to be checking a patient ECG or the location of a field repair crew.

It is therefore submitted that the claims require simultaneous display of both room and patient status, not the absence of such status or location information. The combination of Kuban, Crawford and Khalessi does not disclose or suggest the claimed subject matter and therefore does not result in Applicants' presently claimed invention. As such, the cited references do not render claims 1-37 obvious. Therefore, Applicants respectfully request that the Board reverse the rejection.

For the reasons stated above, Applicants respectfully submit that the rejection of claims 1-37 is overcome, and reversal of the rejection thereof is respectfully requested along with a holding that each of the claims is allowable.

Respectfully submitted,

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# APPENDICES

## APPENDIX OF CLAIMS

1. (Rejected) An apparatus for the graphical display of room and room occupant information, said apparatus comprising:

a display; and

an arrangement for producing a cell for being viewed on said display, said cell simultaneously conveying room status information regarding said room and status information regarding any registered occupant of said room.

2. (Rejected) The apparatus according to Claim 1, further comprising:

an arrangement for producing a matrix for being displayed on said display, said matrix being adapted to depict the rooms for which information is conveyed; and

said arrangement for producing a cell comprising an arrangement for producing a plurality of cells in conjunction with said matrix, wherein each cell corresponds to a different one of the rooms for which information is conveyed.

3. (Rejected) The apparatus according to Claim 2, wherein:

said cell is adapted to display secondary information associated with each attribute of the cell.

4. (Rejected) The apparatus according to Claim 3, wherein the secondary information is displayed solely to authorized users of the apparatus.

5. (Rejected) The apparatus according to Claim 3, wherein said cell is adapted to modify an attribute upon a prompt from an authorized user of the apparatus.

6. (Rejected) The apparatus according to Claim 3, wherein the room is a hospital room.

7. (Rejected) The apparatus according to Claim 3, wherein the room is a hotel room.

8. (Rejected) The apparatus according to Claim 3, wherein the cell depicts a bed.

9. (Rejected) The apparatus according to Claim 3, wherein the cell indicates whether the room is unoccupied.

10. (Rejected) The apparatus according to Claim 3, wherein the cell indicates whether the room is occupied.

11. (Rejected) The apparatus according to Claim 3, wherein the cell indicates whether the room is in a stat condition.

12. (Rejected) The apparatus according to Claim 3, wherein said cell indicates whether a bed within the room is being made.

13. (Rejected) An apparatus for the graphical display of room and room occupant information, said apparatus comprising:

a display;

an arrangement for producing a cell for being viewed on said display, said cell having a plurality of modifiable attributes; and

a controller which modifies at least one of the attributes of said cell in simultaneously conveying information about the current status of said room and any registered occupants of said room, wherein said attributes include both pre-set and user-defined attributes that comprise pre-set and user-defined attribute values.

14. (Rejected) The apparatus according to Claim 13, further comprising:

an arrangement for producing a matrix for being displayed on said display, said matrix being adapted to depict the rooms for which information is conveyed; and

said arrangement for producing a cell comprising an arrangement for producing a plurality of cells in conjunction with said matrix, wherein each cell corresponds to a different one of the rooms for which information is conveyed.

15. (Rejected) The apparatus according to Claim 14, wherein:

said cell is adapted to display secondary information associated with each attribute of the icon.

16. (Rejected) The apparatus according to Claim 15, wherein the secondary information is displayed solely to authorized users of the apparatus.

17. (Rejected) The apparatus according to Claim 16, wherein said controller is adapted to modify an attribute upon a prompt from an authorized user of the apparatus.

18. (Rejected) The apparatus according to Claim 16, wherein the room is a hospital room.

19. (Rejected) The apparatus according to Claim 16, wherein the room is a hotel room.

20. (Rejected) The apparatus according to Claim 16, wherein the cell depicts a bed.

21. (Rejected) The apparatus according to Claim 16, wherein the cell indicates whether the room is unoccupied.

22. (Rejected) The apparatus according to Claim 16, wherein the cell indicates whether the room is occupied.

23. (Rejected) The apparatus according to Claim 16, wherein the cell indicates whether the room is in a stat condition.

24. (Rejected) The apparatus according to Claim 16, wherein said cell indicates whether a bed within the room is being made.

25. (Rejected) A method of graphically displaying room and room occupant information, said method comprising the steps of:

displaying a matrix;

displaying at least one cell within the matrix, each cell corresponding to and simultaneously displaying information relating to said room and any registered occupants of said room, said cell having a plurality of modifiable attributes; and

modifying at least one of the attributes of the cell in conveying information about at least one of the current status of said room and the current status of any registered occupants of said room, wherein said attributes include both pre-set and user-defined attributes that comprise pre-set and user-defined attribute values.

26. (Rejected) The method according to Claim 25, wherein:

at least one cell is adapted to display secondary information associated with at least one attribute of the cell.

27. (Rejected) The method according to Claim 26, wherein the display of said secondary information is restricted.

28. (Rejected) The method according to Claim 27, wherein the secondary information is displayed solely to authorized users.

29. (Rejected) The method according to Claim 28, wherein the authorization of a user is determined by comparing a password provided by the user against a databank of passwords.

30. (Rejected) The method according to Claim 27, wherein the room is a hospital room.

31. (Rejected) The method according to Claim 27, wherein the room is a hotel room.

32. (Rejected) The method according to Claim 27, wherein the cell depicts a bed.

33. (Rejected) The method according to Claim 27, wherein the cell indicates whether the room is unoccupied.

34. (Rejected) The method according to Claim 27, wherein the cell indicates whether the room is occupied.

35. (Rejected) The method according to Claim 27, wherein the cell indicates whether the room is in stat condition.

36. (Rejected) The method according to Claim 27, wherein the cell indicates whether a bed within the room is being made.

37. (Rejected) A program storage device readable by machine, tangibly embodying a program of instructions executable by the machine to perform method steps

for the simultaneous graphical display of information relating to a room and any registered occupants thereof, said method comprising the steps of:

displaying a matrix;

displaying at least one cell within the matrix, each cell corresponding to and simultaneously displaying information relating to said room and any of said registered occupants of said room and having a plurality of modifiable attributes; and

modifying at least one of the attributes of the cell in conveying information about the current status of said room, wherein said attributes include both pre-set and user-defined attributes that comprise pre-set and user-defined attribute values.

## APPENDIX OF EVIDENCE

The following is a list of the evidence entered in the record which Applicants rely upon in the appeal:

Exhibit A: Office Action dated August 17, 2009

Exhibit B: Amendment and Response filed May 15, 2009

Exhibit C: United States Patent No. 4,994,908 to Kuban *et al.*

Exhibit D: United States Patent No. 5,331,547 to Crawford

Exhibit E: United States Patent No. 6,644,900 to Khalessi *et al.*

## APPENDIX OF RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

# EXHIBITS

**EXHIBIT A**

# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/005,985 | 11/12/2001 | Gene E. Nacey | 2556/006 | 9262 |

23861 7590 08/17/2009
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| EXAMINER | |
|---|---|
| BONSHOCK, DENNIS G | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2173 | |

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|---|---|
| 08/17/2009 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

**EXHIBIT A**

| Office Action Summary | Application No. | Applicant(s) |
|---|---|---|
| | 10/005,985 | NACEY, GENE E. |
| | **Examiner** | **Art Unit** |
| | DENNIS G. BONSHOCK | 2173 |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on 15 May 2009.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) 1-37 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-37 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

### *Final Rejection*

### *Response to Amendment*

1. It is hereby acknowledged that the following papers have been received and placed on record in the file: Amendment as received on 5-15-2009.

2. Claims 1-37 have been examined.

Status of Claims:

3. Claims 1-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuban et al., Patent #4,994,908, hereinafter Kuban, Crawford, Jr., Patent #5,331,549, hereinafter Crawford, and Khalessi et al., Patent Number: 6,633,900, hereinafter Khalessi.

### *Claim Rejections - 35 USC § 103*

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuban et al., Patent #4,994,908, hereinafter Kuban, Crawford, Jr., Patent #5,331,549, hereinafter Crawford, and Khalessi et al., Patent Number: 6,633,900, hereinafter Khalessi.

6. With regard to claim 1, which teaches an apparatus for the graphical display of room information, the apparatus comprising, a display and an arrangement for

producing a cell for being viewed on the display, the cell conveying information regarding a room, Kuban teaches, in column 4, lines 30-61 and in figure 3, the display comprising cells where the cells display information regarding the current status of a room. Kuban further teaches, in column 13, lines 5-55 and in figure 3-5, cells under “CURRENT STATUS” that contain a plurality of modifiable attributes, namely the user can make the selected room status either “Occupied” or “Vacant” and also either “Clean” or “Dirty”, these updated statuses are then displayed in the tabular display in the same cell. These room statuses are initially set to preset “historical room status” values before the user begins modifying (see column 13, lines 56-67). A user may set a room to be status “ready/occupied” (or any other attribute/value) which may have not been previously used by the apparatus (such is the case in figure 4). Rooms can have status changes adding additional status information such as a room previously defined to be “Dirty” can be further defined to be “Dirty/Occupied” or “Dirty/Vacant”. Crawford teaches a system for monitoring remote systems (see abstract), similar to that of Kuban, but further teaches simultaneously displaying patient status information and room status information in a common cell (see column 6, lines 3-27 and figures 3 and 4). Crawford’s initial screen displays a plurality of rooms available for selection for closer view and modification (see column 5, line 46 through column 6, line 34 and figures 3 and 4), and the zoom-in screen that calls up details for a particular room, where the user is able to modify attributes (alter the vital sign limits, signs monitored, patient status, etc.) and view other preset attributes (room number, data, time, measured values, etc.) (see column 6, lines 34-59 and figures 3 and 4). In each display of Crawford (floor or in

room) a user can see patient (occupant) status information such as vital signs and color coded alert conditions (GREEN for normal; YELLOW for warning; and RET for critical), and also see room status information such as connection of the system to a rooms vital sign sensors (PURPLE used to indicate a disconnect). Also, room status is shown via a position relative to other rooms on the floor and the particular floor the room located on (see column 5, lines 18-25 and in figure 3). Crawford further teaches user-definable attributes (selected via window [72] for display) and pre-set attributes (such as default vital signs displayed before user selection of window [72]); and further teaches user-definable attribute values (see the customizable vital sign limits of column 8, lines 29-40), which may be pre-set attribute values (see the default vital sign limits of column 8, lines 26-29) (see column 8, lines 22-45, column 9, lines 20-27, and figure 6). It would have been obvious to one of ordinary skill in the art, having the teachings of Kuban and Crawford before him at the time the invention was made to modify the tabular room status display system of Kuban to include simultaneous display of patient (occupant) status as well as room status, as did Crawford. One would have been motivated to make such a combination because this provides a more detailed view of room on the display, alerting a user to multiple dimensions of room alert data.

Khalessi teaches a system in which both human information and location information are conveyed (see column 10, lines 26-67 and in figure 11), but further teaches the combination of human status information and location status information within one cell (see column 10, lines 26-67 and in figure 11). It would have been obvious to one of ordinary skill in the art, having the teachings of Kuban, Crawford, and

Khalessi before him at the time the invention was made to modify the status displays of Kuban and Crawford to include the simultaneous displays of human status information and location status information within one cell, as did Khalessi. One would have been motivated to make such a combination because this allows a managing entity to see more information about both person and location all from within a common view.

7. With regard to claims 2 and 14, which teach an arrangement for producing a matrix for being displayed on the display, the matrix being adapted to depict the rooms for which information is conveyed, said arrangement for producing a cell comprising an arrangement for producing a plurality of cells in conjunction with said matrix, wherein each cell corresponds to a different one of the rooms for which information is conveyed, Kuban further teaches, in column 13, lines 5-55 and in figure 3, a matrix that is used for depicting the room information where the cells provide information for one or the plurality of rooms.

8. With regard to claims 3, 15, and 26, Kuban teach the system for conveying room information for a plurality of rooms to a remote location in a matrix form (see column 4, lines 30-61 and in figure 3). Kuban, however, doesn't specifically mention the cells being adapted to display secondary information associated with each attribute of the cell. Crawford teaches a system for monitoring remote systems (see abstract), similar to that of Kuban, but further teaches that upon selection additional information can be displayed for a specific element (see column 2, lines 44-47, column 6, lines 34-47, and figures 3 and 4). It would have been obvious to one of ordinary skill in the art, having the teachings of Kuban and Crawford before him at the time the invention was made to

modify the remote monitoring system of Kuban to include the focused information screen as did Crawford. One would have been motivated to make such a combination because this would allow for specific information (possibly a summery of room charges, or special services requested) regarding the selected room to be displayed to the people at the manager location.

9. With regard to claims 4, 16, and 28, which teach the secondary information being displayed solely to an authorized user of the apparatus, Kuban further teaches, in column 4, lines 45-61, the manager being able to view specific information, an the maid/inspector being able to see their own specific subset of information.

10. With regard to claims 5 and 17, which teach the cell being adapted to modify an attribute upon a prompt from an authorized user of the apparatus, Kuban further teaches, in column 3, lines 51-53, the system being capable of input (ex: changing to a cleaned status).

11. With regard to claims 6, 18, and 30, which teach the room being a hospital room, Kuban teaches, in column 5, lines 5-25, the communications or room status being used in a hotel/hospital environment.

12. With regard to claims 7, 19, and 31, which teach the room being a hotel room, Kuban teaches, in column 5, lines 5-25, the communications or room status being used in a hotel/hospital environment.

13 With regard to claims 8, 20, and 32, which teach the cell depicting a bed, Crawford further teaches, in column 2, lines 44-47 and figures 3 and 4, the display of bed information.

14. With regard to claims 9, 21, and 33, which teach the cell indicating if the room is unoccupied, Kuban teaches, in column 4, lines 30-39, the cell depicting either a occupied or vacant for the room.

15. With regard to claims 10, 22, and 34, which teach the cell indicating if the room is occupied, Kuban teaches, in column 4, lines 30-39, the cell depicting either a occupied or vacant for the room.

16. With regard to claims 11, 23, and 35, which teach the cell indicating whether the room is in a stat condition, Kuban teaches, in column 4, lines 46-51, the matrix displaying a need to be made up indication.

17. With regard to claims 12, 24, and 36, which teach the cell indicating whether a bed within the room is being made, column 4, lines 40-45, the system knowing that a room is in the process of being made up/inspected.

18. With regard to claim 13, which teaches an apparatus for the graphical display of room information, the apparatus comprising, a display and an arrangement for producing a cell for being viewed on the display, Kuban teaches, in column 4, lines 30-61 and in figure 3, the display comprising cells where the cells display information regarding the current status of a room. With regard to claim 13, further teaching the cell having a plurality of modifiable attributes, and a controller for modifying the modifiable attributes, Kuban further teaches, in column 15, line 42 through column 16, line 2, the maid going through the process in which a worker enters their ID, and enters the room for processing, thereby changing the status of the room. Kuban further teaches, in column 13, lines 5-55 and in figure 3-5, cells under "CURRENT STATUS" that contain a

plurality of modifiable attributes, namely the user can make the selected room status either “Occupied” or “Vacant” and also either “Clean” or “Dirty”, these updated statuses are then displayed in the tabular display in the same cell. These room statuses are initially set to preset “historical room status” values before the user begins modifying (see column 13, lines 56-67). A user may set a room to be status “ready/occupied” (or any other attribute/value) which may have not been previously used by the apparatus (such is the case in figure 4). Rooms can have status changes adding additional status information such as a room previously defined to be “Dirty” can be further defined to be “Dirty/Occupied” or “Dirty/Vacant”. Crawford teaches a system for monitoring remote systems (see abstract), similar to that of Kuban, but further teaches simultaneously displaying patient status information and room status information in a common cell (see column 6, lines 3-27 and figures 3 and 4). Crawford’s initial screen displays a plurality of rooms available for selection for closer view and modification (see column 5, line 46 through column 6, line 34 and figures 3 and 4), and the zoom-in screen that calls up details for a particular room, where the user is able to modify attributes (alter the vital sign limits, signs monitored, patient status, etc.) and view other preset attributes (room number, data, time, measured values, etc.) (see column 6, lines 34-59 and figures 3 and 4). In each display of Crawford (floor or in room) a user can see patient (occupant) status information such as vital signs and color coded alert conditions (GREEN for normal; YELLOW for warning; and RET for critical), and also see room status information such as connection of the system to a rooms vital sign sensors (PURPLE used to indicate a disconnect). Also, room status is shown via a position relative to

other rooms on the floor and the particular floor the room located on (see column 5, lines 18-25 and in figure 3). Crawford further teaches user-definable attributes (selected via window [72] for display) and pre-set attributes (such as default vital signs displayed before user selection of window [72]); and further teaches user-definable attribute values (see the customizable vital sign limits of column 8, lines 29-40), which may be pre-set attribute values (see the default vital sign limits of column 8, lines 26-29) (see column 8, lines 22-45, column 9, lines 20-27, and figure 6). It would have been obvious to one of ordinary skill in the art, having the teachings of Kuban and Crawford before him at the time the invention was made to modify the tabular room status display system of Kuban to include simultaneous display of patient (occupant) status as well as room status, as did Crawford. One would have been motivated to make such a combination because this provides a more detailed view of room on the display, alerting a user to multiple dimensions of room alert data.

Khalessi teaches a system in which both human information and location information are conveyed (see column 10, lines 26-67 and in figure 11), but further teaches the combination of human status information and location status information within one cell (see column 10, lines 26-67 and in figure 11). It would have been obvious to one of ordinary skill in the art, having the teachings of Kuban, Crawford, and Khalessi before him at the time the invention was made to modify the status displays of Kuban and Crawford to include the simultaneous displays of human status information and location status information within one cell, as did Khalessi. One would have been

motivated to make such a combination because this allows a managing entity to see more information about both person and location all from within a common view.

19. With regard to claim 25, which teaches a method of graphically displaying room information, the method comprising, the displaying a matrix, Kuban teaches, in figure 3, the display of a matrix of rooms with associated status information. With regard to claim 25, further teaching a display and an arrangement for producing a cell, in the matrix, for being viewed on the display, Kuban teaches, in column 4, lines 30-61 and in figure 3, the display comprising cells where the cells display information regarding the current status of a room. With regard to claim 25, further teaching the cell having a plurality of modifiable attributes, and a controller for modifying the modifiable attributes, Kuban further teaches, in column 15, line 42 through column 16, line 2, the maid going through the process in which a worker enters their ID, and enters the room for processing, thereby changing the status of the room. Kuban further teaches, in column 13, lines 5-55 and in figure 3-5, cells under "CURRENT STATUS" that contain a plurality of modifiable attributes, namely the user can make the selected room status either "Occupied" or "Vacant" and also either "Clean" or "Dirty", these updated statuses are then displayed in the tabular display in the same cell. These room statuses are initially set to preset "historical room status" values before the user begins modifying (see column 13, lines 56-67). A user may set a room to be status "ready/occupied" (or any other attribute/value) which may have not been previously used by the apparatus (such is the case in figure 4). Rooms can have status changes adding additional status information such as a room previously defined to be "Dirty" can be further defined to be

"Dirty/Occupied" or "Dirty/Vacant". Crawford teaches a system for monitoring remote systems (see abstract), similar to that of Kuban, but further teaches simultaneously displaying patient status information and room status information in a common cell (see column 6, lines 3-27 and figures 3 and 4). Crawford's initial screen displays a plurality of rooms available for selection for closer view and modification (see column 5, line 46 through column 6, line 34 and figures 3 and 4), and the zoom-in screen that calls up details for a particular room, where the user is able to modify attributes (alter the vital sign limits, signs monitored, patient status, etc.) and view other preset attributes (room number, data, time, measured values, etc.) (see column 6, lines 34-59 and figures 3 and 4). In each display of Crawford (floor or in room) a user can see patient (occupant) status information such as vital signs and color coded alert conditions (GREEN for normal; YELLOW for warning; and RET for critical), and also see room status information such as connection of the system to a rooms vital sign sensors (PURPLE used to indicate a disconnect). Also, room status is shown via a position relative to other rooms on the floor and the particular floor the room located on (see column 5, lines 18-25 and in figure 3). Crawford further teaches user-definable attributes (selected via window [72] for display) and pre-set attributes (such as default vital signs displayed before user selection of window [72]); and further teaches user-definable attribute values (see the customizable vital sign limits of column 8, lines 29-40), which may be pre-set attribute values (see the default vital sign limits of column 8, lines 26-29) (see column 8, lines 22-45, column 9, lines 20-27, and figure 6). It would have been obvious to one of ordinary skill in the art, having the teachings of Kuban and Crawford

before him at the time the invention was made to modify the tabular room status display system of Kuban to include simultaneous display of patient (occupant) status as well as room status, as did Crawford. One would have been motivated to make such a combination because this provides a more detailed view of room on the display, alerting a user to multiple dimensions of room alert data.

Khalessi teaches a system in which both human information and location information are conveyed (see column 10, lines 26-67 and in figure 11), but further teaches the combination of human status information and location status information within one cell (see column 10, lines 26-67 and in figure 11). It would have been obvious to one of ordinary skill in the art, having the teachings of Kuban, Crawford, and Khalessi before him at the time the invention was made to modify the status displays of Kuban and Crawford to include the simultaneous displays of human status information and location status information within one cell, as did Khalessi. One would have been motivated to make such a combination because this allows a managing entity to see more information about both person and location all from within a common view.

20. With regard to claim 27, which teaches that the display of secondary I formation is restricted, Kuban further teaches, in column 4, lines 51-61, additional information that is only available to system managers upon sign-on.

21. With regard to claim 29, which teach authorization of a user being determined by comparing a password provided by the user to a databank of passwords, Kuban further teaches, in column 15, lines 42-61, the user entering an access code and ID to implement the system.

22. With regard to claim 37, which teaches a program storage device readable by machine, tangibly embodying a program of instructions executable by the machine to perform method steps for the graphical display of room information, the method comprising, the displaying a matrix, Kuban teaches, in figure 3, the display of a matrix of rooms with associated status information. With regard to claim 37, further teaching a display and an arrangement for producing a cell, in the matrix, Kuban teaches, in column 4, lines 30-61 and in figure 3, the display comprising cells where the cells display information regarding the current status of a room. With regard to claim 37, further teaching the cell having a plurality of modifiable attributes, and a controller for modifying the modifiable attributes, Kuban further teaches, in column 15, line 42 through column 16, line 2, the maid going through the process in which a worker enters their ID, and enters the room for processing, thereby changing the status of the room. Kuban further teaches, in column 13, lines 5-55 and in figure 3-5, cells under "CURRENT STATUS" that contain a plurality of modifiable attributes, namely the user can make the selected room status either "Occupied" or "Vacant" and also either "Clean" or "Dirty", these updated statuses are then displayed in the tabular display in the same cell. These room statuses are initially set to preset "historical room status" values before the user begins modifying (see column 13, lines 56-67). A user may set a room to be status "ready/occupied" (or any other attribute/value) which may have not been previously used by the apparatus (such is the case in figure 4). Rooms can have status changes adding additional status information such as a room previously defined to be "Dirty" can be further defined to be "Dirty/Occupied" or "Dirty/Vacant". Crawford teaches a system

for monitoring remote systems (see abstract), similar to that of Kuban, but further teaches simultaneously displaying patient status information and room status information in a common cell (see column 6, lines 3-27 and figures 3 and 4). Crawford's initial screen displays a plurality of rooms available for selection for closer view and modification (see column 5, line 46 through column 6, line 34 and figures 3 and 4), and the zoom-in screen that calls up details for a particular room, where the user is able to modify attributes (alter the vital sign limits, signs monitored, patient status, etc.) and view other preset attributes (room number, data, time, measured values, etc.) (see column 6, lines 34-59 and figures 3 and 4). In each display of Crawford (floor or in room) a user can see patient (occupant) status information such as vital signs and color coded alert conditions (GREEN for normal; YELLOW for warning; and RET for critical), and also see room status information such as connection of the system to a rooms vital sign sensors (PURPLE used to indicate a disconnect). Also, room status is shown via a position relative to other rooms on the floor and the particular floor the room located on (see column 5, lines 18-25 and in figure 3). Crawford further teaches user-definable attributes (selected via window [72] for display) and pre-set attributes (such as default vital signs displayed before user selection of window [72]); and further teaches user-definable attribute values (see the customizable vital sign limits of column 8, lines 29-40), which may be pre-set attribute values (see the default vital sign limits of column 8, lines 26-29) (see column 8, lines 22-45, column 9, lines 20-27, and figure 6). It would have been obvious to one of ordinary skill in the art, having the teachings of Kuban and Crawford before him at the time the invention was made to modify the tabular room

status display system of Kuban to include simultaneous display of patient (occupant) status as well as room status, as did Crawford. One would have been motivated to make such a combination because this provides a more detailed view of room on the display, alerting a user to multiple dimensions of room alert data.

Khalessi teaches a system in which both human information and location information are conveyed (see column 10, lines 26-67 and in figure 11), but further teaches the combination of human status information and location status information within one cell (see column 10, lines 26-67 and in figure 11). It would have been obvious to one of ordinary skill in the art, having the teachings of Kuban, Crawford, and Khalessi before him at the time the invention was made to modify the status displays of Kuban and Crawford to include the simultaneous displays of human status information and location status information within one cell, as did Khalessi. One would have been motivated to make such a combination because this allows a managing entity to see more information about both person and location all from within a common view.

### ***Response to Arguments***

The arguments filed on 5-15-2009 have been fully considered but they are not persuasive. Reasons set forth below.

Applicant's arguments with respect to claims 1, 13, 25, and 37 have been considered but are moot in view of the new ground(s) of rejection.

## *Conclusion*

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DENNIS G. BONSHOCK whose telephone number is (571)272-4047. The examiner can normally be reached on Monday - Friday, 5:30 a.m. - 3:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kieu Vu can be reached on (571) 272-4057. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Dennis G. Bonshock/
Primary Examiner, Art Unit 2173
8-11-09
dgb

**EXHIBIT B**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | | |
|---|---|---|
| Group Art Unit 2173 | : | PATENT APPLICATION |
| Examiner D. Bonshock | : | |
| In re application of | : | **VISUAL DISPLAY OF ROOM INFORMATION** |
| GENE E. NACEY | : | |
| Serial No.: 10/005,985 | : | |
| Filed: November 12, 2001 | : | |

**AMENDMENT**

Pittsburgh, Pennsylvania 15222
May 15, 2009

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Office Action mailed on February 18, 2009, with the three-month shortened statutory period for response set to expire on May 18, 2009, please reconsider the above-identified application in view of the claims as amended herein and the following remarks.

**Listing of Claims** begins on page 2 of this paper.

**Remarks/Arguments** begin on page 8 of this paper.

**EXHIBIT B**

## Claims Pending

1. (Currently Amended) An apparatus for the graphical display of room and room occupant information, said apparatus comprising:

a display; and

an arrangement for producing a cell for being viewed on said display, said cell simultaneously conveying room status information regarding ~~a~~ said room and status information regarding any registered occupant of said room.

2. (Original) The apparatus according to Claim 1, further comprising:

an arrangement for producing a matrix for being displayed on said display, said matrix being adapted to depict the rooms for which information is conveyed; and

said arrangement for producing a cell comprising an arrangement for producing a plurality of cells in conjunction with said matrix, wherein each cell corresponds to a different one of the rooms for which information is conveyed.

3. (Original) The apparatus according to Claim 2, wherein:

said cell is adapted to display secondary information associated with each attribute of the cell.

4. (Original) The apparatus according to Claim 3, wherein the secondary information is displayed solely to authorized users of the apparatus.

5. (Original) The apparatus according to Claim 3, wherein said cell is adapted to modify an attribute upon a prompt from an authorized user of the apparatus.

6. (Original) The apparatus according to Claim 3, wherein the room is a hospital room.

7. (Original) The apparatus according to Claim 3, wherein the room is a hotel room.

8. (Original) The apparatus according to Claim 3, wherein the cell depicts a bed.

9. (Original) The apparatus according to Claim 3, wherein the cell indicates whether the room is unoccupied.

10. (Original) The apparatus according to Claim 3, wherein the cell indicates whether the room is occupied.

11. (Original) The apparatus according to Claim 3, wherein the cell indicates whether the room is in a stat condition.

12. (Original) The apparatus according to Claim 3, wherein said cell indicates whether a bed within the room is being made.

13. (Currently Amended) An apparatus for the graphical display of room and room occupant information, said apparatus comprising:

a display;

an arrangement for producing a cell for being viewed on said display, said cell having a plurality of modifiable attributes; and

a controller which modifies at least one of the attributes of said cell in simultaneously conveying information about the current status of ~~a~~ said room and any registered occupants of said room, wherein said attributes include both pre-set and user-defined attributes that comprise pre-set and user-defined attribute values .

14. (Previously Presented) The apparatus according to Claim 13, further comprising:

an arrangement for producing a matrix for being displayed on said display, said matrix being adapted to depict the rooms for which information is conveyed; and

said arrangement for producing a cell comprising an arrangement for producing a plurality of cells in conjunction with said matrix, wherein each cell corresponds to a different one of the rooms for which information is conveyed.

15. (Previously Presented) The apparatus according to Claim 14, wherein:

said cell is adapted to display secondary information associated with each attribute of the icon.

16. (Previously Presented) The apparatus according to Claim 15, wherein the secondary information is displayed solely to authorized users of the apparatus.

17. (Original) The apparatus according to Claim 16, wherein said controller is adapted to modify an attribute upon a prompt from an authorized user of the apparatus.

18. (Original) The apparatus according to Claim 16, wherein the room is a hospital room.

19. (Original) The apparatus according to Claim 16, wherein the room is a hotel room.

20. (Original) The apparatus according to Claim 16, wherein the cell depicts a bed.

21. (Original) The apparatus according to Claim 16, wherein the cell indicates whether the room is unoccupied.

22. (Original) The apparatus according to Claim 16, wherein the cell indicates whether the room is occupied.

23. (Original) The apparatus according to Claim 16, wherein the cell indicates whether the room is in a stat condition.

24. (Original) The apparatus according to Claim 16, wherein said cell indicates whether a bed within the room is being made.

25. (Currently Amended) A method of graphically displaying room and room occupant information, said method comprising the steps of:

displaying a matrix;

displaying at least one cell within the matrix, each cell corresponding to and simultaneously displaying information relating to ~~a~~ said room and any registered occupants of said room, said cell having a plurality of modifiable attributes; and

modifying at least one of the attributes of the cell in conveying information about at least one of the current status of ~~the~~ said room and the current status of any registered occupants of said room, wherein said attributes include both pre-set and user-defined attributes that comprise pre-set and user-defined attribute values.

26. (Previously Presented) The method according to Claim 25, wherein:

at least one cell is adapted to display secondary information associated with at least one attribute of the cell.

27. (Previously Presented) The method according to Claim 26, wherein the display of said secondary information is restricted.

28. (Previously Presented) The method according to Claim 27, wherein the secondary information is displayed solely to authorized users.

29. (Previously Presented) The method according to Claim 28, wherein the authorization of a user is determined by comparing a password provided by the user against a databank of passwords.

30. (Original) The method according to Claim 27, wherein the room is a hospital room.

31. (Original) The method according to Claim 27, wherein the room is a hotel room.

32. (Original) The method according to Claim 27, wherein the cell depicts a bed.

33. (Original) The method according to Claim 27, wherein the cell indicates whether the room is unoccupied.

34. (Original) The method according to Claim 27, wherein the cell indicates whether the room is occupied.

35. (Original) The method according to Claim 27, wherein the cell indicates whether the room is in stat condition.

36. (Previously Presented) The method according to Claim 27, wherein the cell indicates whether a bed within the room is being made.

37. (Currently Amended) A program storage device readable by machine, tangibly embodying a program of instructions executable by the machine to perform method steps for the simultaneous graphical display of information relating to a room and any registered occupants thereof, said method comprising the steps of:

displaying a matrix;

displaying at least one cell within the matrix, each cell corresponding to and simultaneously displaying information relating to said room and any of said registered occupants of said room and having a plurality of modifiable attributes; and

modifying at least one of the attributes of the cell in conveying information about the current status of ~~the~~ said room, wherein said attributes include both pre-set and user-defined attributes that comprise pre-set and user-defined attribute values.

## REMARKS

### I. Status of the Claims

Claims 1-37 stand in this application. In the Office Action mailed on February 18, 2009, claims 1-37 were rejected. Favorable reconsideration and allowance of the standing claims are respectfully requested.

### II. Rejections Under 35 U.S.C. § 103

Claims 1-37 stand rejected under 35 U.S.C. § 103(a) as being obvious over Kuban et al., United States Patent No. 4,994,908 ("Kuban") in view of Crawford, Jr., United States Patent No. 5,331,549 ( "Crawford"). Applicant respectfully traverses the rejection, and requests reconsideration and withdrawal of the obviousness rejection.

Kuban is entirely directed to the tracking and display of room information using a cable television system. Kuban, Abstract. This includes occupancy and status information such as room temperature. There is no teaching or suggestion in Kuban directed to providing any additional status information relating to anything other than the room itself. Furthermore, the Office Action concedes that Kuban fails to teach simultaneously conveying room and occupant status information as previously discussed in prior submissions.

Crawford discloses the tracking and display of physiological status information. While the system does contemplate providing this information in a graphical format which may reference the room in which the patient is located on a floor, there is no teaching or suggestion of integrating the physiological information with any room status information.

According to the Office Action in response to Applicant's prior arguments, the Examiner states that Crawford teaches the simultaneous display of patient and room status information in a

common cell, relying on Col. 6, lines 3-27 and Figs. 3 and 4. Further the Examiner states that Crawford displays multicolor coded alert conditions. The Examiner reads broadly on the term "status of the room" as required by the claims and relies upon a disclosure of the location of the room as fitting within this status. Lastly, the Examiner states that the color coded condition which indicates a disconnected monitor reveals room status, such as if the patient has left the room.

Applicant respectfully disagrees with the Examiner's characterization. Furthermore, Applicant has amended the claim to more fully and accurately require "room status" information. Room status information is clearly identified, on pages 7 and 8 of the application as referring to the variable conditions associated with the room and not the room's location or any other permanent attribute of the physical space encompassing the room. As such, the room location cannot be identified as room status as defined by the claims in light of the specification.

With respect to the Examiner's characterization of the color coded warning lights of the Crawford system, the mere absence of a warning light, or a warning light which is merely reflective of a disconnected vital signs monitor cannot be considered as a teaching or suggestion of room status. The absence of an indicator conveys absolutely nothing about the room, only that no information is presently known. The room could be occupied or unoccupied, clean or dirty. The purpose of the system is to convey real time status information and the claims are therefore drawn to require the simultaneous display of such information. Reference to an indicator which lacks any output as indicating an empty room is improper, as that conclusion cannot be accurately drawn. Furthermore, the disconnection of monitoring equipment in the room from an occupant, such as identified in the Examiner's example of a patient that has gone for a CAT scan, is an insufficient teaching or suggestion of a room status monitor. The presence

of a disconnected status light or other indicator merely discloses that such equipment is not in use. Certainly the patient could still be present in the room while such equipment is not in use, as the same equipment may not have been prescribed or required by the patient's attending physician. Thus the patient may be present and the disconnected status would not accurately reflect the room status. It is therefore submitted that the claims, as currently amended, require simultaneous display of both room and patient status (and not merely the absence of such status) and Kuban/Crawford does not disclose or suggest the same.

## CONCLUSION

It is believed that claims 1-37 are in allowable form. Accordingly, a timely Notice of Allowance to this effect is earnestly solicited.

The Examiner is invited to contact the undersigned at 412-918-1110 to discuss any matter concerning this application.

The Office is hereby authorized to charge any additional fees or credit any overpayments under 37 C.F.R. § 1.16 or § 1.17 to the previously authorized deposit account.

Respectfully submitted,

METZ LEWIS LLC

/ Barry I. Friedman /
Barry I. Friedman, Reg. No. 33,695
Under 37 CFR 1.34(a)

Dated: May 15 2009

11 Stanwix Street, 18th Floor
Pittsburgh, Pennsylvania 15222
(412) 918-1100

**EXHIBIT C**

# United States Patent [19]

**Kuban et al.**

[11] **Patent Number:** **4,994,908**

[45] **Date of Patent:** **Feb. 19, 1991**


[54] **INTERACTIVE ROOM STATUS/TIME INFORMATION SYSTEM**


[75] Inventors: **Curt M. Kuban**, Snellville; **Jeffrey C. Ting**, Lawrenceville; **Fitzroy E. Williams**, Lawrenceville; **Lee R. Johnson**, Lawrenceville; **Elizabeth A. Smith**, Cumming; **Howard L. Myers**, Lawrenceville, all of Ga.

[73] Assignee: **Scientific-Atlanta, Inc.**, Atlanta, Ga.



[21] Appl. No.: **340,660**

[22] Filed: **Apr. 20, 1989**

**Related U.S. Application Data**

[63] Continuation-in-part of Ser. No. 289,218, Dec. 23, 1988.

[51] **Int. Cl.**[5] .................................... **H04N 7/10**

[52] **U.S. Cl.** .................................... **358/86**; 455/5

[58] **Field of Search** .................... 358/86; 455/5, 4



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*Primary Examiner*—Jin F. Ng

*Assistant Examiner*—Wing F. Chan

*Attorney, Agent, or Firm*—Banner, Birch, McKie & Beckett


[57] **ABSTRACT**


An interactive room status/time information system is provided having a terminal associated with a television comprising a processor for processing data, an associated memory for storing operation data and control algorithms, a keypad with remote control for inputting information, a character generator responsive to the processor for generating a multiple character, multiple line display, a power supply input, and a cable transmission link for communication at television frequencies with a system manager. A maid or inspector can send status information from a hotel/hospital room terminal over a cable television system to a system manager location. The status of a room for occupancy is determined by a two-step procedure. Input from both a maid and an inspector must be received before a room has a ready-for-occupancy status. Screens of compiled room status and historical data can be displayed at the system manager. Also, certain screens of room status data may be displayed on an associated television at the room terminal. Functions can be performed at the system manager location including searching stored status information for historical data of a particular room or maid. In accordance with a further time control feature of the present system, a hotel guest may actuate a wake-up mode of operation of a room terminal through a terminal keyboard or remote control. The system manager subsequently polls the terminal to determine if the room terminal is properly operating or if the wake-up alarm has been responded to. If not, hotel personnel may be dispatched to the room.


**42 Claims, 14 Drawing Sheets**

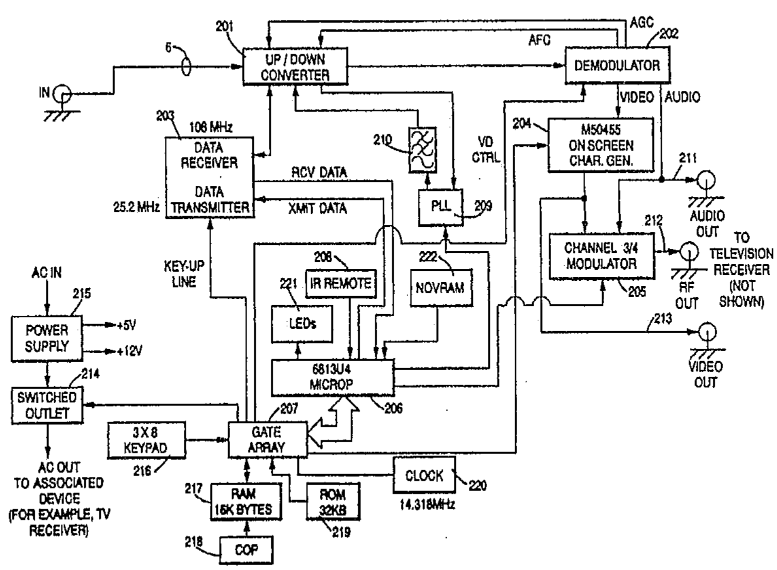


**EXHIBIT C**

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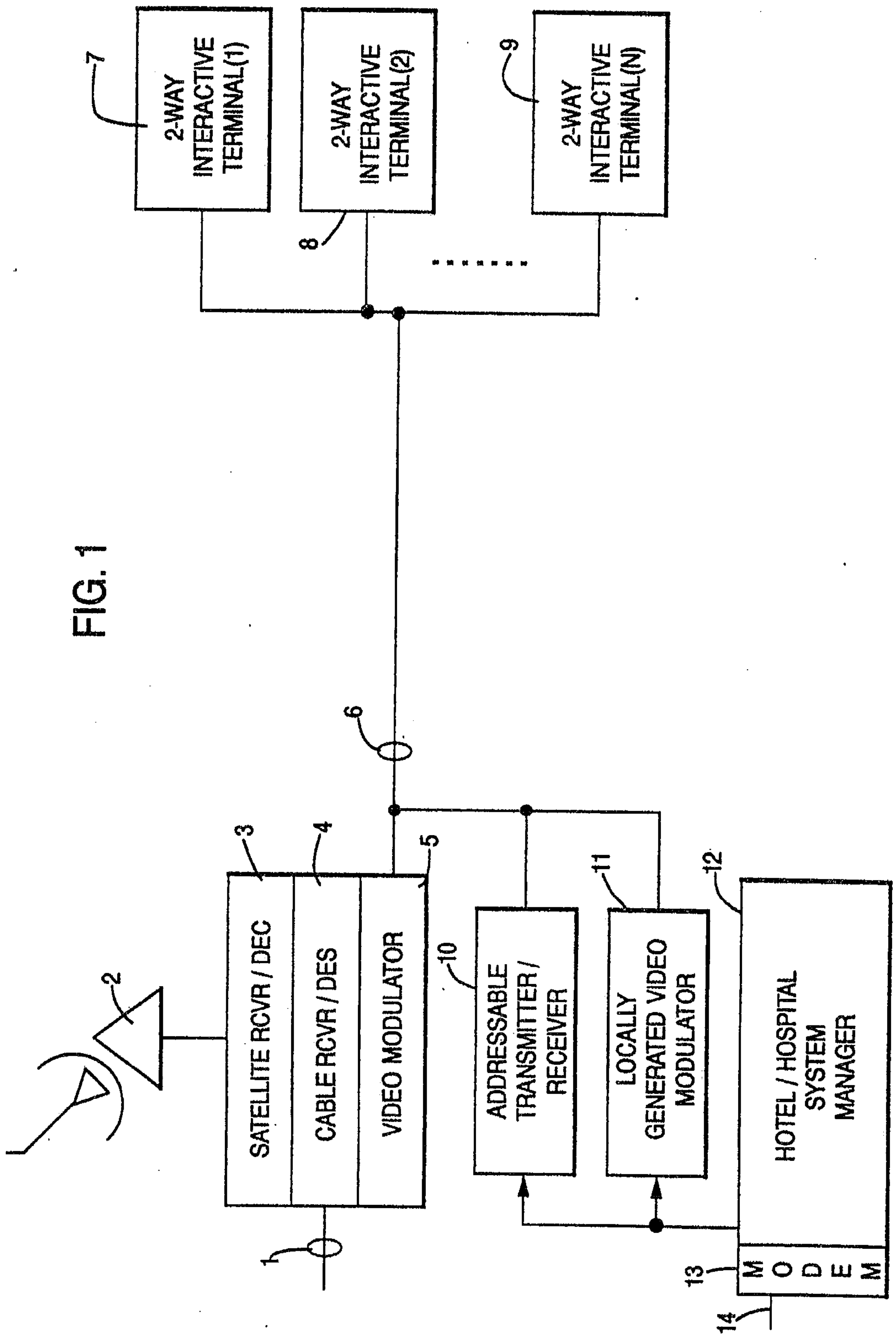

2-WAY INTERACTIVE TERMINAL(1)
2-WAY INTERACTIVE TERMINAL(2)
2-WAY INTERACTIVE TERMINAL(N)
SATELLITE RCVR / DEC
CABLE RCVR / DES
VIDEO MODULATOR
ADDRESSABLE TRANSMITTER / RECEIVER
LOCALLY GENERATED VIDEO MODULATOR
HOTEL / HOSPITAL SYSTEM MANAGER
MODEM
1
2
3
4
5
6
7
8
9
10
11
12
13
14

FIG. 1

FIG. 2

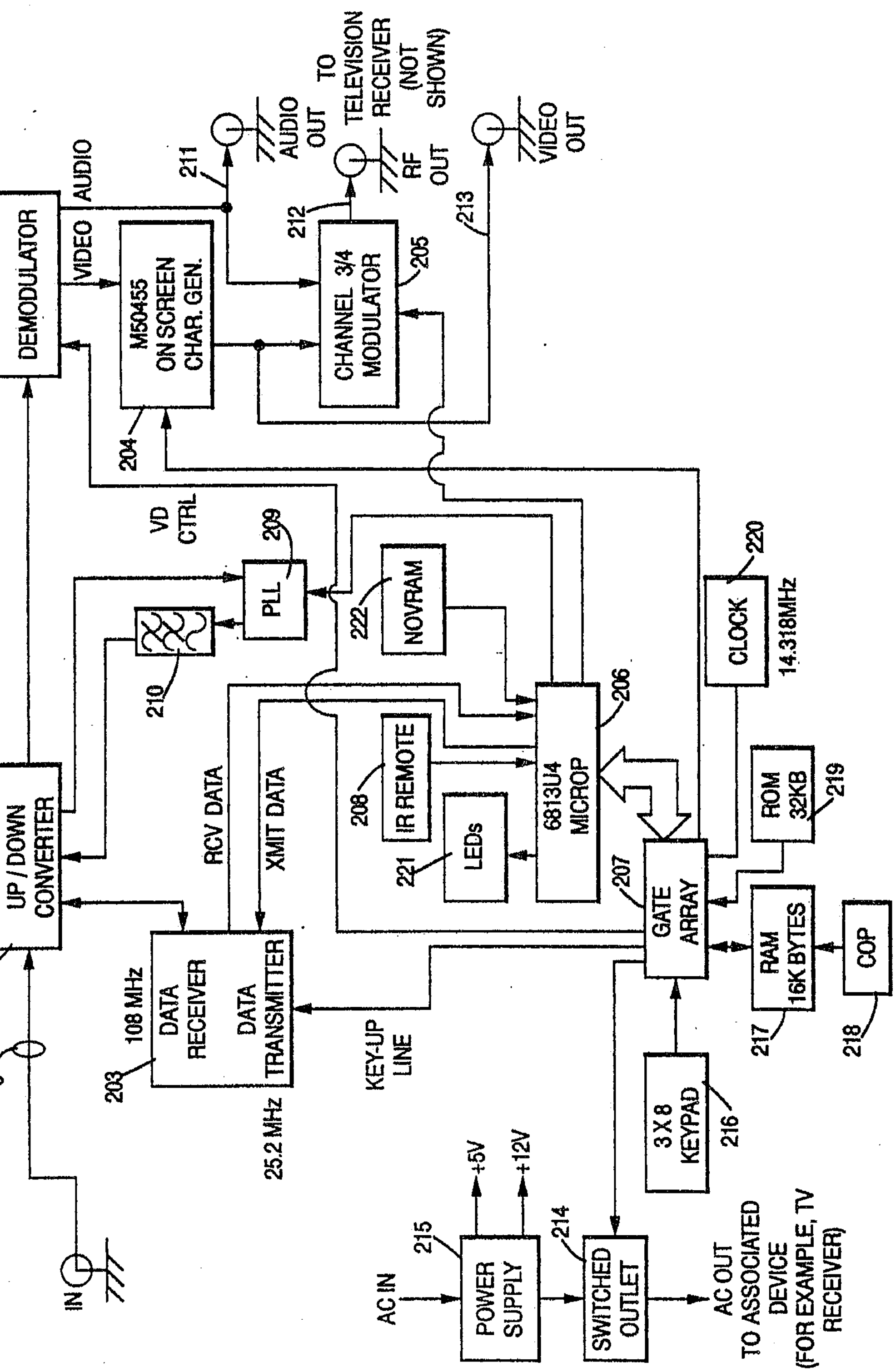
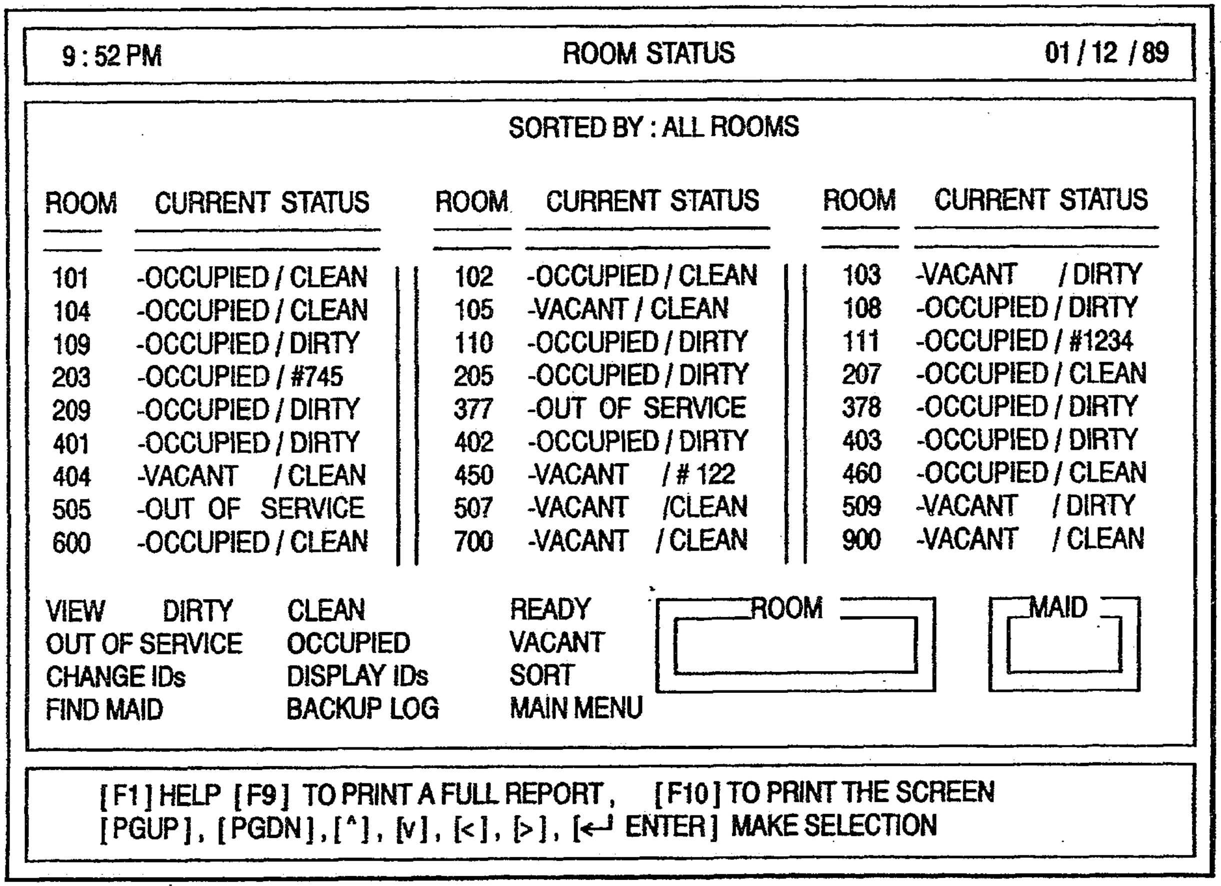

IN
6
201
UP / DOWN CONVERTER
AGC
AFC
202
DEMODULATOR
VIDEO
AUDIO
204
M50455 ON SCREEN CHAR. GEN.
211
AUDIO OUT
TO TELEVISION RECEIVER (NOT SHOWN)
212
RF OUT
213
VIDEO OUT
CHANNEL 3/4 MODULATOR
205
VD CTRL
209
PLL
210
203
108 MHz
DATA RECEIVER
DATA TRANSMITTER
25.2 MHz
RCV DATA
XMIT DATA
KEY-UP LINE
222
NOVRAM
206
6813U4 MICROP
208
IR REMOTE
221
LEDs
207
GATE ARRAY
220
CLOCK
14.318MHz
ROM 32KB
219
RAM 16K BYTES
217
COP
218
3 X 8 KEYPAD
216
+5V
+12V
215
POWER SUPPLY
AC IN
214
SWITCHED OUTLET
AC OUT TO ASSOCIATED DEVICE (FOR EXAMPLE, TV RECEIVER)

FIG. 3





9 : 52 PM
ROOM STATUS
01 / 12 / 89
SORTED BY : ALL ROOMS
ROOM CURRENT STATUS ROOM CURRENT STATUS ROOM CURRENT STATUS
101 -OCCUPIED / CLEAN 102 -OCCUPIED / CLEAN 103 -VACANT / DIRTY
104 -OCCUPIED / CLEAN 105 -VACANT / CLEAN 108 -OCCUPIED / DIRTY
109 -OCCUPIED / DIRTY 110 -OCCUPIED / DIRTY 111 -OCCUPIED / #1234
203 -OCCUPIED / #745 205 -OCCUPIED / DIRTY 207 -OCCUPIED / CLEAN
209 -OCCUPIED / DIRTY 377 -OUT OF SERVICE 378 -OCCUPIED / DIRTY
401 -OCCUPIED / DIRTY 402 -OCCUPIED / DIRTY 403 -OCCUPIED / DIRTY
404 -VACANT / CLEAN 450 -VACANT / # 122 460 -OCCUPIED / CLEAN
505 -OUT OF SERVICE 507 -VACANT /CLEAN 509 -VACANT / DIRTY
600 -OCCUPIED / CLEAN 700 -VACANT / CLEAN 900 -VACANT / CLEAN
VIEW DIRTY CLEAN READY
OUT OF SERVICE OCCUPIED VACANT
CHANGE IDs DISPLAY IDs SORT
FIND MAID BACKUP LOG MAIN MENU
ROOM
MAID
[F1] HELP [F9] TO PRINT A FULL REPORT, [F10] TO PRINT THE SCREEN
[PGUP], [PGDN], [^], [v], [<], [>], [↵ ENTER] MAKE SELECTION

FIG. 4



9 : 52 PM ROOM STATUS 01 / 12 / 89

SORTED BY : ALL ROOMS

| ROOM | CURRENT STATUS | ROOM | CURRENT STATUS | ROOM | CURRENT STATUS |
|---|---|---|---|---|---|
| 101 | -OCCUPIED / CLEAN | 102 | -OCCUPIED / CLEAN | 103 | -VACANT / DIRTY |
| 104 | -OCCUPIED / CLEAN | 105 | -VACANT / CLEAN | 108 | -OCCUPIED / DIRTY |
| 109 | -OCCUPIED / DIRTY | 110 | -OCCUPIED / DIRTY | 111 | -OCCUPIED / #1234 |
| 203 | -OCCUPIED / #745 | 205 | -OCCUPIED / DIRTY | 207 | -OCCUPIED / CLEAN |
| 209 | -OCCUPIED / DIRTY | 377 | -OUT OF SERVICE | 378 | -OCCUPIED / DIRTY |
| 401 | -OCCUPIED / DIRTY | 402 | -OCCUPIED / DIRTY | 403 | -OCCUPIED / DIRTY |
| 404 | -VACANT / CLEAN | 450 | -VACANT / # 122 | 460 | -OCCUPIED / CLEAN |
| 505 | -OUT OF SERVICE | 507 | -VACANT /CLEAN | 509 | -VACANT / DIRTY |
| 600 | -OCCUPIED / CLEAN | 700 | -VACANT / CLEAN | 900 | -VACANT / CLEAN |

| | | | | |
|---|---|---|---|---|
| SORT : | CLEAN | DIRTY | READY | VACANT |
| | CLEAN \ OCCUPIED | DIRTY \ OCCUPIED | READY \ OCCUPIED | OCCUPIED |
| | CLEAN \ VACANT | DIRTY \ VACANT | READY \ VACANT | OUT OF SERVICE |
| | ALL ROOMS | PREVIOUS MENU | | |

[ F1 ] HELP [ F9 ] TO PRINT A FULL REPORT , [ F10 ] TO PRINT THE SCREEN
[ PGUP ] , [ PGDN ] , [ ^ ] , [v] , [<] , [>] , [↵ ENTER ] MAKE SELECTION

FIG. 5



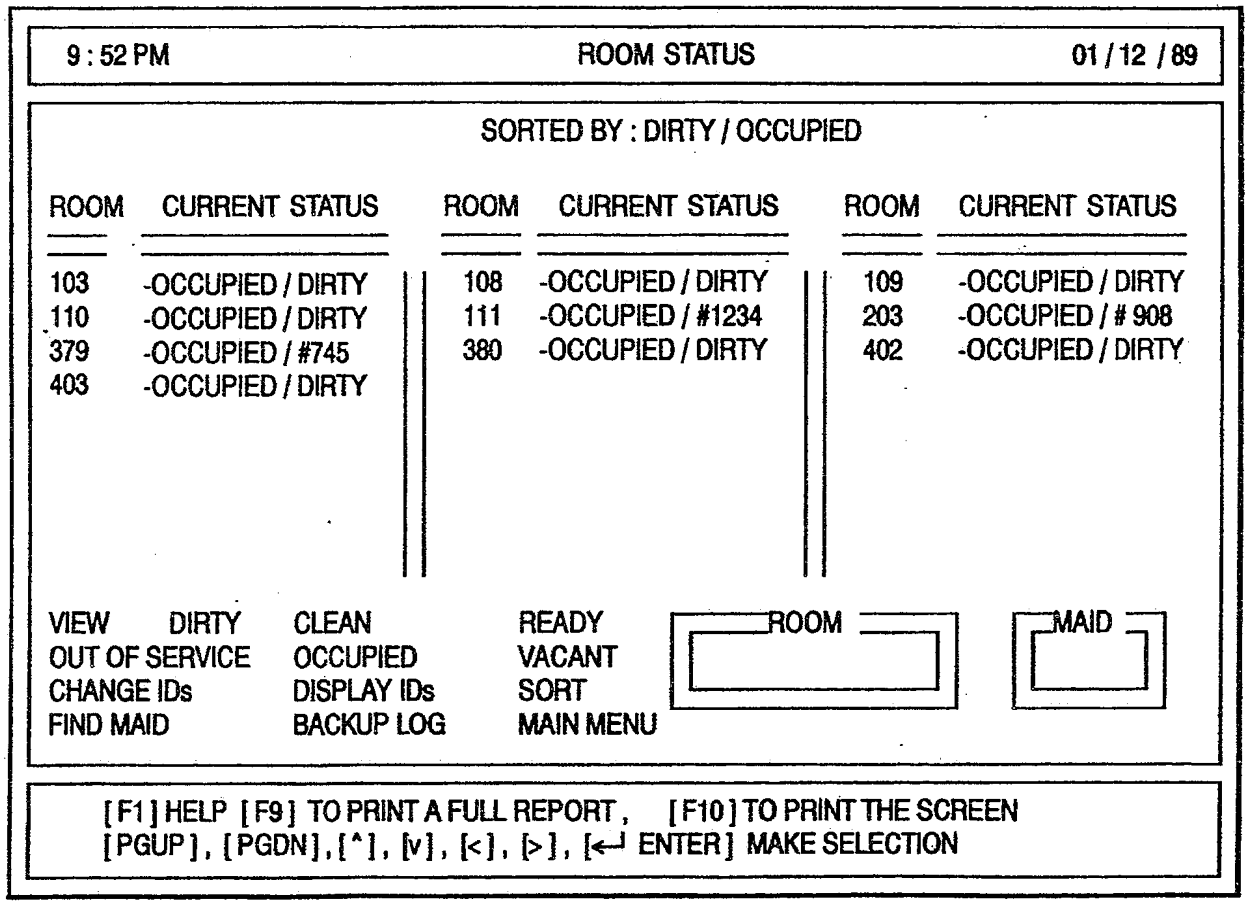

9 : 52 PM
ROOM STATUS
01 / 12 / 89
SORTED BY : DIRTY / OCCUPIED
ROOM CURRENT STATUS ROOM CURRENT STATUS ROOM CURRENT STATUS
103 -OCCUPIED / DIRTY
110 -OCCUPIED / DIRTY
379 -OCCUPIED / #745
403 -OCCUPIED / DIRTY
108 -OCCUPIED / DIRTY
111 -OCCUPIED / #1234
380 -OCCUPIED / DIRTY
109 -OCCUPIED / DIRTY
203 -OCCUPIED / # 908
402 -OCCUPIED / DIRTY
VIEW DIRTY CLEAN READY
OUT OF SERVICE OCCUPIED VACANT
CHANGE IDs DISPLAY IDs SORT
FIND MAID BACKUP LOG MAIN MENU
ROOM
MAID
[F1] HELP [F9] TO PRINT A FULL REPORT, [F10] TO PRINT THE SCREEN
[PGUP], [PGDN], [^], [v], [<], [>], [↵ ENTER] MAKE SELECTION

FIG. 6



9 : 52 PM CHANGE IDS 01 / 22 / 88

ADD NEW NAME
CHANGE NAME
CHANGE IDENTIFICATION
CHANGE AUTHORIZATION
VIEW NAME
VIEW IDENTIFICATION
RETURN TO PREVIOUS MENU
RETURN TO MAIN MENU

EMPLOYEE NAME
DUNN / CATHERINE S
AUTHORIZATION
MAID
IDENTIFICATION
1234

[F1] HELP [F9] TO PRINT A FULL REPORT , [F10] TO PRINT THE SCREEN
[PGUP] , [PGDN] , [^] , [v] , [<] , [>] , [↵ ENTER] MAKE SELECTION

FIG. 7



9 : 52 PM IDENTIFICATION NUMBERS 01 / 12 / 89

| ID | AUTH | NAME | ID | AUTH | NAME |
|---|---|---|---|---|---|
| 0011 | MAID | DUNN / DELORES R | 0012 | MAID | DUNN / CATHERINE S |
| 0304 | MAID | FONTAYNE / DEBRA P | 0701 | MAID | JACKSON / MARY E |
| 2098 | SUPV | FRANK / HENRY W | 3077 | SUPV | SMITH / SARAH F |

PREVIOUS MENU RETURN TO MAIN MENU

[F1] HELP [F9] TO PRINT A FULL REPORT , [F10] TO PRINT THE SCREEN
[PGUP] , [PGDN] , [^] , [v] , [<] , [>] , [↵ ENTER] MAKE SELECTION

FIG. 8



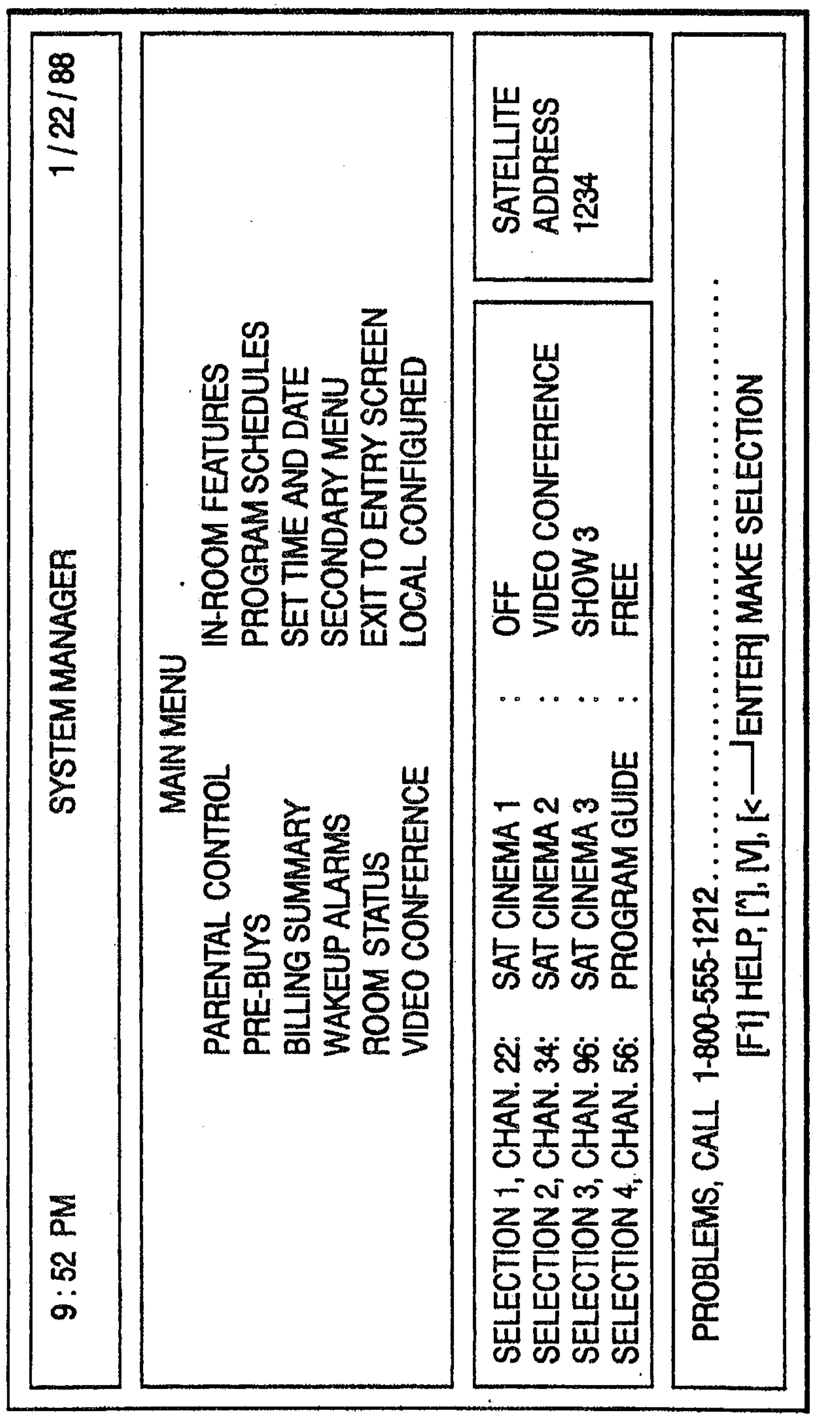

9 : 52 PM
SYSTEM MANAGER
1 / 22 / 88
MAIN MENU
PARENTAL CONTROL
PRE-BUYS
BILLING SUMMARY
WAKEUP ALARMS
ROOM STATUS
VIDEO CONFERENCE
IN-ROOM FEATURES
PROGRAM SCHEDULES
SET TIME AND DATE
SECONDARY MENU
EXIT TO ENTRY SCREEN
LOCAL CONFIGURED
SELECTION 1, CHAN. 22: SAT CINEMA 1 : OFF
SELECTION 2, CHAN. 34: SAT CINEMA 2 : VIDEO CONFERENCE
SELECTION 3, CHAN. 96: SAT CINEMA 3 : SHOW 3
SELECTION 4, CHAN. 56: PROGRAM GUIDE : FREE
SATELLITE
ADDRESS
1234
PROBLEMS, CALL 1-800-555-1212..........................
[F1] HELP, [↑], [↓], [←┘ENTER] MAKE SELECTION

FIG. 9



| | | | |
|---|---|---|---|
| ROOM # | MAID # | START TIME | FINISH TIME |
| ROOM # | MAID # | START TIME | FINISH TIME |
| ROOM # | MAID # | START TIME | FINISH TIME |
| " " | " " | " " | " " |

FIG. 14(a)



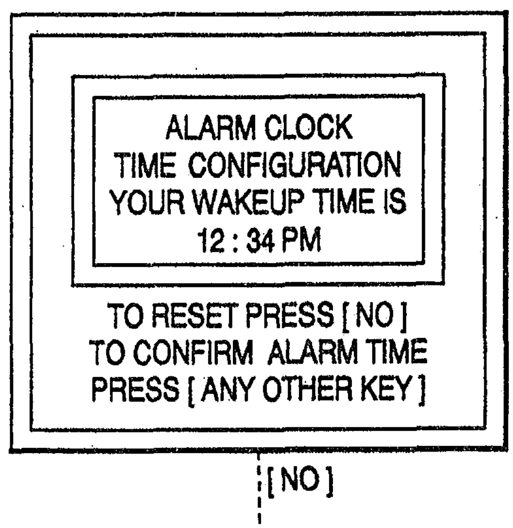



FIG. 14(b)

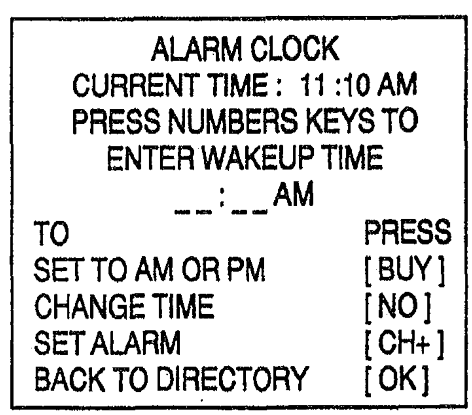


FIG. 10(a)

ROOM STATUS / INVENTORY

ENTER THE ACCESS CODE
FOR THIS FEATURE . . .
---->______?

THEN PRESS [ OK ] WHEN
CODE APPEARS CORRECT
-OR-
PRESS [ NO ] TO EXIT

FIG. 10(b)

ROOM STATUS / INVENTORY

NOW ENTER YOUR
HOUSEKEEPER ID
---->______?

THEN PRESS [ OK ]
TO START CLEANING
THIS ROOM.

FIG. 10(c)

ROOM STATUS / INVENTORY

PRESS ANY KEY

WHEN FINISHED

CLEANING THIS ROOM

FIG. 11(a)

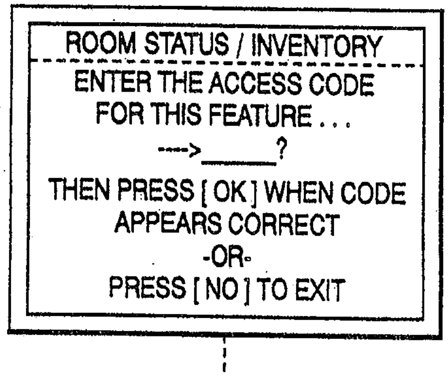





FIG. 11(b)

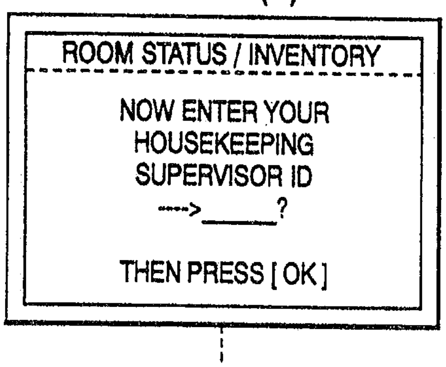
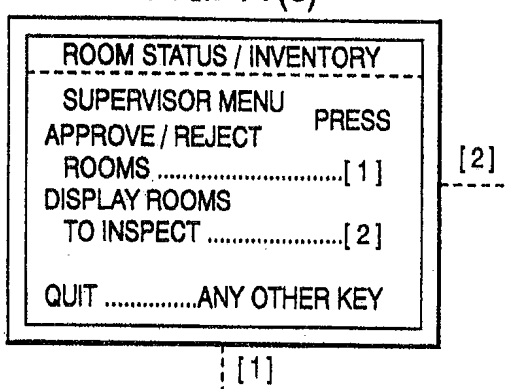



FIG. 11(c)




TO FIG. 11(e)

FIG. 11(d)

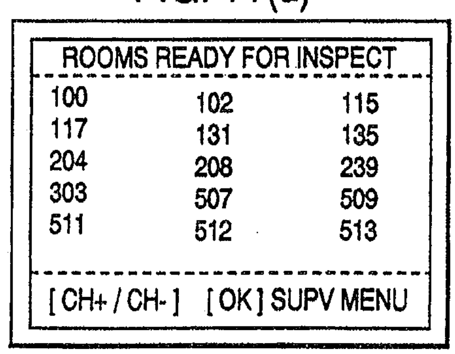


FIG. 11(e)

FROM FIG. 11(c)

ROOM STATUS / INVENTORY

| | PRESS |
|---|---|
| SINGLE ROOM ................ | [ 1 ] |
| RANGE OF ROOMS ........ | [ 2 ] |
| SUPERVISOR MENU ...... | [ CH- ] |
| QUIT ............ ....ANY OTHER KEY | |

[ 1 ]

[ 2 ]

FIG. 11(f)

ROOMS READY FOR INSPECT

ENTER ROOM NAME

---->______?

| AND THEN | PRESS |
|---|---|
| TO ACCEPT ROOM........... | [ OK ] |
| TO REJECT ROOM........... | [ NO ] |
| TO RETRY......................... | [ BUY ] |
| TO PREVIOUS MENU....... | [ CH- ] |
| TO QUIT............................ | [ CH+ ] |

FIG. 11(g)

ROOM STATUS / INVENTORY

ENTER THE BEGINNING OF
A RANGE OF ROOM NAMES

---->______?

| AND THEN | PRESS |
|---|---|
| IF CORRECT ..................... | [ OK ] |
| TO RETRY ......................... | [ BUY ] |
| TO PREVIOUS MENU ...... | [ CH- ] |
| TO QUIT ........................... | [ NO ] |

TO FIG. 11(h)

FIG. 11(h)

FROM FIG. 11(g)

ROOM STATUS / INVENTORY

ENTER THE END OF A
RANGE OF ROOM NAMES
---->______?

AND THEN ............ PRESS
IF CORRECT ............ [ OK ]
TO RETRY ............ [ BUY ]
TO PREVIOUS MENU ...... [ CH- ]
TO QUIT ............ [ NO ]



FIG. 11(i)

ROOM STATUS / INVENTORY

BEGIN WITH ROOM 1101
END WITH ROOM 1115

AND THEN ............ PRESS
TO ACCEPT ............ [ OK ]
TO REJECT ............ [ NO ]
TO CANCEL ............ [ BUY ]

[ OK ]

FIG. 11(k)

ROOM STATUS / INVENTORY

ROOMS 1101
THROUGH ROOMS 1115
HAVE BEEN REJECTED

PRESS
ANOTHER RANGE ............ [ OK ]
SUPERVISOR MENU .......... [ CH- ]
TO QUIT ............ ANY OTHER KEY

[ NO ]

FIG. 11(j)

ROOM STATUS / INVENTORY

ROOMS 1101
THROUGH ROOMS 1115
HAVE BEEN ACCEPTED

PRESS
ANOTHER RANGE ............ [ OK ]
SUPERVISOR MENU .......... [ CH- ]
TO QUIT ............ ANY OTHER KEY

FIG. 12



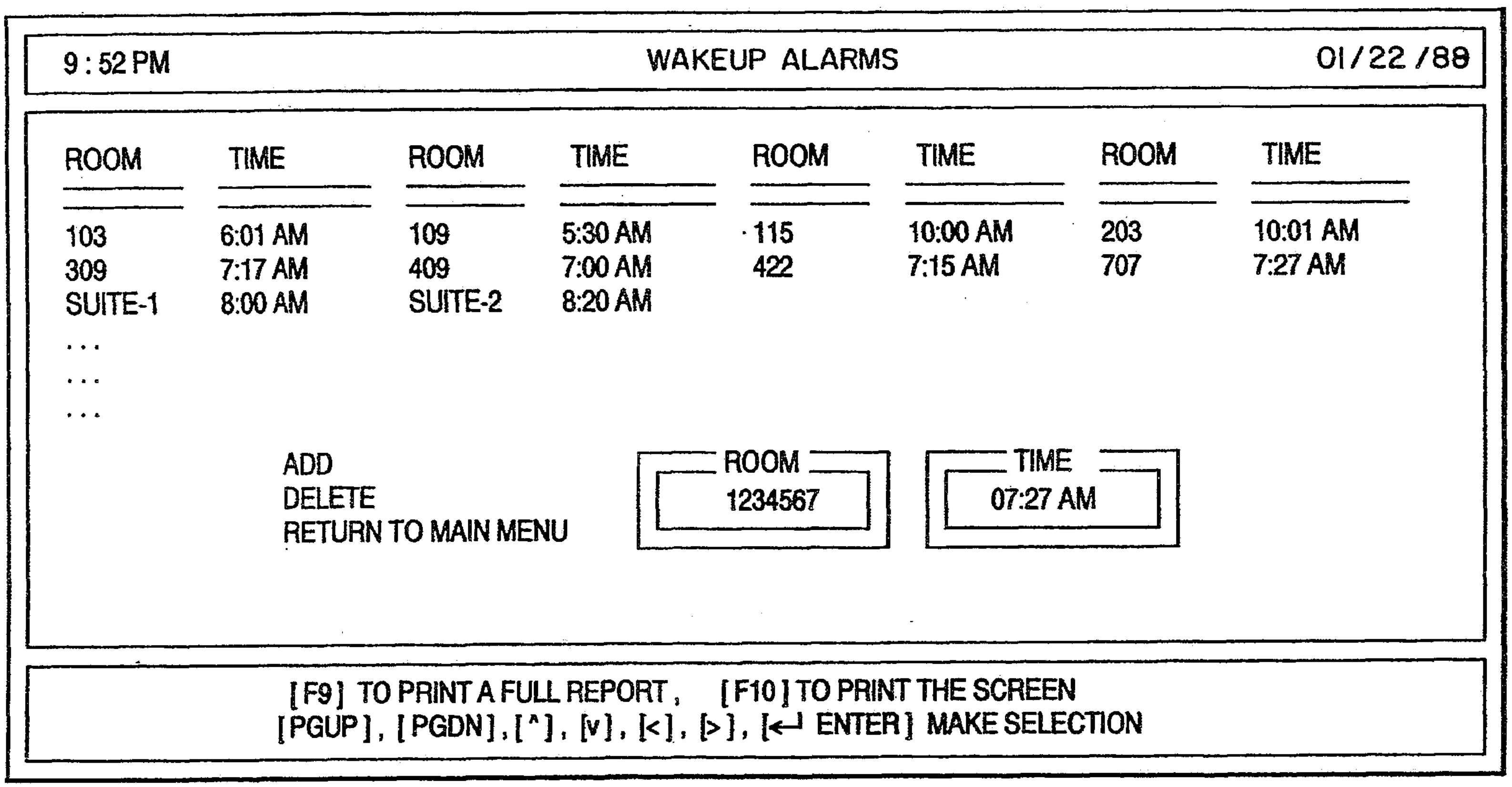
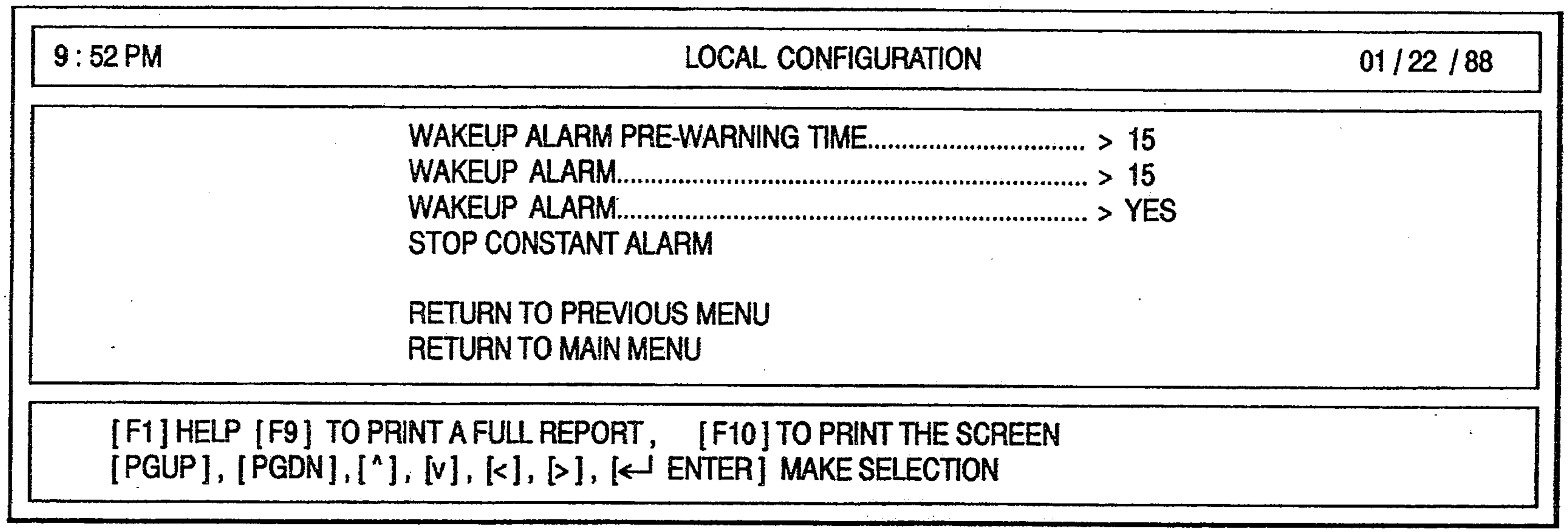

9 : 52 PM
WAKEUP ALARMS
01/22/88
ROOM
TIME
ROOM
TIME
ROOM
TIME
ROOM
TIME
103
6:01 AM
109
5:30 AM
115
10:00 AM
203
10:01 AM
309
7:17 AM
409
7:00 AM
422
7:15 AM
707
7:27 AM
SUITE-1
8:00 AM
SUITE-2
8:20 AM
...
...
...
ADD
DELETE
RETURN TO MAIN MENU
ROOM
1234567
TIME
07:27 AM
[F9] TO PRINT A FULL REPORT, [F10] TO PRINT THE SCREEN
[PGUP], [PGDN], [^], [v], [<], [>], [↵ ENTER] MAKE SELECTION

FIG. 13




9 : 52 PM
LOCAL CONFIGURATION
01 / 22 / 88
WAKEUP ALARM PRE-WARNING TIME.................................. > 15
WAKEUP ALARM.................................................................. > 15
WAKEUP ALARM.................................................................. > YES
STOP CONSTANT ALARM
RETURN TO PREVIOUS MENU
RETURN TO MAIN MENU
[ F1 ] HELP [ F9 ] TO PRINT A FULL REPORT , [ F10 ] TO PRINT THE SCREEN
[ PGUP ] , [ PGDN ] , [ ^ ] , [v] , [<] , [>] , [↵ ENTER ] MAKE SELECTION

# INTERACTIVE ROOM STATUS/TIME INFORMATION SYSTEM

## CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of U.S. application Ser. No. 289,218, filed Dec. 23, 1988 and entitled "Automatic Interactive Television Terminal Configuration" and is related to U.S. application Ser. Nos.: 07/340,642, entitled "Cable Television Transaction Terminal"; 07/342,987, entitled "Storage Control Method and Apparatus for an Interactive Television Terminal"; 07/340,731, entitled "Terminal Authorization Method"; 07/340,987, entitled "Interactive Television Terminal with Programmable Background Audio or Video"; and 07/340,659, entitled "Terminal Polling Method" filed concurrently herewith.

## BACKGROUND OF THE INVENTION

1. Technical Field

This invention primarily relates to the field of two-way interactive hotel/hospital systems typically provided over cable facilities and, more particularly, relates to a method and apparatus for room status, for timekeeping and for wake-up communications.

2. Description of the Relevant Art

Two-way interactive cable television systems are known for transmitting entertainment, information and data signals over a cable facility toward a plurality of users. Data may be transmitted and addressed to a particular subscriber over a separate data channel or a so-called "in-band" data channel. In a downstream direction, address control data may represent services authorized to a particular terminal or control commands to that terminal. In an upstream direction, from a terminal to the service provider or system manager location, control data may represent selections made by a user in response to a polling request or at the time of user selection.

Terminals are often manufactured with stored unique identification numbers which may be unknown to a user for security purposes. Nevertheless, the unique identification number is necessary for the system manager to enter a terminal into a system along with location related information and configuration information.

Interactive terminals generally have been equipped without the capability of locally generating a display such as alphanumeric characters on an associated television receiver. A terminal-provided display such as a liquid crystal display of a selected channel number at a terminal is inadequate for providing an effective man-machine interface for accomplishing a complicated task.

Keys normally provided at interactive terminals comprise a complement of numeric input keys, channel increment keys, volume control keys, a power button and a "buy" key. However, these keys are inappropriately labeled and may confuse the user if simultaneously employed for other uses.

An addressable CATV converter with a graphics display generator to generate signals for the presentation of text on a television screen is described in U.S. Pat. No. 4,536,791, specifically incorporated herein by reference. Although this patent increases the display capability of an addressable converter, it does not expand the interactive functions of the converter.



It is also known in the art of non-interactive cable television terminals having a programmable read only memory to enable remote programming of the terminal. Remote programming is enabled via inputting a special code not provided with the standard remote control transmitter associated with the terminal. According to U.S. Pat. No. 4,792,972, which issued Dec. 20, 1988, entitled "Remote Programming Of A CATV Channel Authorization Unit" and incorporated herein by reference, an installer employs a special programming unit equipped with, for example, an infrared transmitter to remotely program the read only memory of a so-called "plain Jane" converter, which is not addressable over a communications link by a system manager, nor is the converter capable of return transmissions. Via the special code, access is obtained to the read only memory into which the memory is loaded with premium channels and services authorization data. The converter is not equipped with a character generator and has no capability to locally generate character screens for display on an associated television receiver. All activities are controlled from the special code transmitting remote programming unit.

Systems for communicating room status information of buildings are known in the art. For example, U.S. Pat. No. 3,675,204, describes a system for monitoring the status of hotel rooms by communicating information at low frequencies over a twisted pair, preferably connected directly to telephone lines in a hotel. Maids and inspectors can determine whether a room is clean or dirty on terminals placed throughout the hotel. Transmitting terminals are located in closets. The maids enter room numbers and an "occupied" or "vacant" status at the terminals. A main display panel displays the status of rooms once collected for display.

British patent specification No. 1,536,534, published Dec. 20, 1978, describes a computer-based hotel management system. Room status information such as vacant, vacant and out-of-service, cleaned, not cleaned, being cleaned, and ready for inspection are possible. Insertion or removal of a maid or housekeeper's key into a hard wired switch causes the status of a room to change. Morning call capability is also disclosed via an alarm buzzer connected to a refrigerated drink storage unit provided in a hotel room. A morning call request is entered into the system at a porter's keyboard/printer. When a cancel button in the room is depressed, the central computer is informed and the alarm is cancelled. If a guest does not respond within five minutes, a warning message is printed on the porter's terminal and the call is automatically cancelled.

The above systems all require specialized wiring and hardware for communication. Furthermore, they do not provide for direct communication from each room. Communication for room status and morning call capabilities is difficult because of the limited input/output capabilities of the hardware. In these prior systems, a limited display capability, if any, is used at each room. The addition of a more capable display to such existing systems would be very costly. Furthermore, these prior systems require added installation expense for connection of twisted pairs to telephone lines or for connection of hard wires to a central computer. These prior systems are not capable of communicating over existing communication mediums using little if any additional hardware; they require the addition of costly input/output switches and displays.

U.S. Pat. No. 3,819,862 describes a hotel room status information system. Portable units are connected to a telephone network to send room status data to a hotel manager or to a housekeeper display. Transmission of status data via a television antenna cable is discussed as a possible alternative to the particularly disclosed transmission by telephone line using audio frequency signals.

U.S. Pat. Nos. 3,944,742 and 4,360,828, discuss a hotel communication system for transmission of data from a plurality of transmitters over a master antenna television system (MATV). Transmission of maid status data over an antenna television system is suggested, yet specific details of what the data comprise or how to gather this maid status information are not explained.

There remains a need in the art for a room status/time information system for communicating from hotel rooms with little if any additional hardware over an existing communication medium having low cost, high capability input/output and a low cost, high capability display.

## SUMMARY OF THE INVENTION

It is an object of the present invention to provide an interactive room terminal capable of being configured for specialized functions.

It is a further object of the present invention to provide an interactive terminal for communication over a building's cable television system.

It is a further object of the present invention to provide an interactive terminal with an alphanumeric display on an associated television screen.

It is a further object of the present invention to provide a room communication system for communicating with little or no additional hardware over an existing communication medium.

It is a further object of the present invention to provide a room communication system having a configurable input keyboard with remote control using little if any additional hardware.

It is a still further object of the present invention to provide a room communication system having a programmable multiple character, multiple line display using little if any additional hardware.

It is a further object of the present invention to provide an interactive terminal capable of communicating room status information.

It is a further object of the present invention to provide a room status system capable of sorting historical data on the status of rooms or the activities of a maid.

It is a further object of the present invention to provide a room status system capable of input by a maid supervisor/room inspector.

It is a further object of the present invention to provide a room status system capable of performing maid or supervisor timekeeping functions.

It is a further object of the present invention to provide a system for communicating time information between a system manager and a plurality of room terminals.

It is a further object of the present invention to provide a time correction feature for sending time correction signals from a system manager to room terminals in the event of a power failure.

It is a further object of the present invention to provide an interactive terminal for sounding a wake-up or other alarm at a predetermined time.

It is a further object of the present invention to provide a multi-room wake-up system wherein wake-up can be ordered at a room terminal.

It is a further object of the present invention to provide a multi-room wake-up system capable of tabulating requested wake-ups at a system manager.

It is a further object of the present invention to provide a multi-room wake-up system capable of indicating the tabulation of rooms not responding to a wake-up alarm.

It is a further object of the present invention to provide a multi-room wake-up system capable of indicating the need for a manual wake-up call prior to the time of a scheduled wake-up call in the event of an inoperative room terminal.

The problems and related deficiencies of the prior art are solved by the principles of the present invention, an interactive room status/time information system having a terminal associated with a television comprising a processor for processing data, an associated memory for storing operation data and for storing control algorithms, a keypad with remote control for inputting information, a two-way cable television transceiver, a character generator responsive to the processor for generating a multiple character, multiple line display on the associated television, and a power supply input, the cable television transceiver for two-way communication at cable television frequencies with a system manager.

A maid or inspector (maid's supervisor) sends status information from the terminal over a cable transmission link to a system manager location, at which location, the time of data reporting may be stored in memory. At the system manager, room status information such as occupied/vacant and dirty/clean can be tabulated and displayed for all the rooms in the hotel. Also, for example, timekeeping data and identification of a particular maid presently making up a room or identification of a room which is out-of-service can also be displayed.

The status of a room for occupancy is determined by a two-step procedure. First, an input from a maid must be received before a room can have a clean status. Second, an input from an inspector (maid's supervisor) must be received before a room can have a ready-for-occupancy status.

Also, custom screens are displayed at the system manager or alternatively at the room terminal, including, for example, maid and inspector sign-on screens, maid and inspector data-input screens, rooms-to-be-made-up screens, rooms-to-be-inspected screens, room-status display screens or the like. Furthermore, other displays and functions can be performed at the system manager location including, for example, searching and short-term storage of status information, long-term storage on disk of status information and searching stored status information for historical data of the status of a particular room or the activities of a particular maid. These advanced capabilities allow features such as finding the location of a maid at any given time or displaying a sorted list of rooms to be inspected, occupied or the like.

A hotel guest may actuate a wake-up mode of operation of a room terminal through a terminal keyboard or remote control. First, a user selects a wake-up service screen and enters the exact wake-up time. The terminal then associates the terminal with the room number and stores the time for wake-up. At the appointed time for wake-up, the terminal activates a piezoelectric alarm to

wake the guest. The system manager periodically, for example, every minute updates the accurate time reported by a clock of the terminal. Consequently, the time reported by the terminal is corrected automatically in the event of a power outage.

The system manager periodically polls the terminal to obtain the user entered time and room number. The system manager subsequently polls the terminal at the appointed time to determine if the wake-up alarm has been responded to. If not, hotel personnel may be dispatched by the system manager to the room to determine if, for example, the hotel guest is a heavy sleeper or has had a heart attack. As an additional feature, the system manager determines if the room terminal is out of order within a predetermined number of minutes prior to a scheduled wake up time. If the terminal is in fact out of order, the system manager may actuate a warning alarm to dispatch hotel personnel to wake the hotel guest.

The present invention improves upon the prior room status communication and wake-up techniques. Communication is integrated into an existent communication medium between each hotel/hospital room and a central location, i.e., where the system manager may be located. Little if any additional hardware is required for connection to the chosen communication medium or for input/output and display with a user. A programmable multi-line, multi-character display is also provided at no additional cost. Also the keys on a room terminal or, alternatively, on a remote control are individually configurable to particular functions.

These and other features of the present invention will become evident from the following detailed description of the invention when read in conjunction with the appended drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block schematic diagram of an interactive room status/time information system in accordance with the present invention.

FIG. 2 is a block schematic diagram of a two-way interactive terminal according to the present invention comprising a microprocessor, a memory, a character generator, a keypad, and a television signal output to an associated television receiver.

FIG. 3 is an exemplary screen for display at the system manager. This screen is exemplary of a tabulation of rooms and their status. A menu of commands is also included in the exemplary screen.

FIG. 4 is another exemplary screen illustrating the menu of sort commands when the sort option is selected from the menu of FIG. 3.

FIG. 5 is another exemplary screen illustrating the tabulation of rooms and their status sorted by dirty/occupied.

FIG. 6 is another exemplary screen of the change ID option.

FIG. 7 is another exemplary screen of the display ID option.

FIG. 8 is another exemplary screen of an initial menu.

FIG. 9 exemplifies a display used for maid timekeeping.

FIGS. **10**(*a*)-**10**(*c*) are screens exemplary of maid sign-on and room cleaning functions generated for display on a television receiver associated with a room terminal according to FIG. 2.

FIGS. **11**(*a*)-**11**(*k*) are other screens exemplary of inspector sign-on and room inspection functions including display of rooms to be inspected and for logging the inspection of a range of rooms generated for display on a television receiver associated with a room terminal according to FIG. 2.

FIG. 12 is an exemplary screen for display at the system manager of selected wake-up times for particular rooms.

FIG. 13 is another exemplary screen for display at the system manager of wake-up alarm configuration parameters.

FIGS. **14**(*a*) and **14**(*b*) are screens exemplary of a wake-up request sequence generated for display on a television receiver associated with a room terminal according to FIG. 2.

## DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, there is shown a block schematic diagram of an interactive room status/time information system in accordance with the present invention. The depicted embodiment relates to its application in a hotel or hospital system environment; however, the present invention is not so limited. The present invention may also be applied in any two-way interactive system such as a cable or satellite television entertainment system involving a distribution network comprising trunk lines and feeder cables of optical or coaxial cable. For example, satellite receiver and decoder **3**, cable receiver and descrambler **4**, video modulator **5**, addressable transmitter receiver **10**, locally generated video modulator **11**, and system manager **12** may all be located at the location of a cable television system headend. Besides the use of the above-mentioned equipment at the headend of a city-wide cable television distribution system, the above-mentioned equipment can be used, for example, at a central location at a hotel, hospital, cruise ship, office building, apartment complex, airport, factory, prison, univeristy, or any other similar facility. In this example, transmission link **6**, for example, a coaxial cable or optical fiber link can connect the cable television headend to two-way interactive terminals **7**, **8** or **9** of the entertainment system located at individual subscriber premises.

On the other hand, the embodiment of FIG. 1 is especially exemplary of the application of the present invention in a hotel or hospital system. Transmission link **6**, then, may simply comprise a coaxial or optical fiber cable link between a control center and N terminals, for example, terminals **7**, **8** or **9** located in rooms of the facility. The terminals can be located at various locations throughout a facility such as a hotel room, a hospital room, a ballroom, a conference room, a clerk inspector or other individual's office, a broom closet, a laundry room, a casino, a break room, a nurse station, a front desk, a message center, a lecture hall, a lounge, a dorm room, a work station, a laboratory, a guard desk, a prison cell or any other similar location in a facility. Many uses are possible for the room terminal besides room status, timekeeping and wake up. The room terminal can be used for ordering room service, for checkout, for video conferencing, for premium program selection, for shopping, for bulletin board information, for airline reservations, for gambling and gambling or any other service used in a facility. Further details of room service and room checkout services are incorporated herein by reference to U.S. application Ser. No. 07/340,642 entitled "Cable Television Transaction Terminal." Further details of video conferencing and premium program

selection are incorporated herein by reference to U.S. application Ser. No. 07/340,731 entitled "Terminal Authorization Method."

In particular, at the control center, a satellite signal may be received at satellite antenna 2 and then received and decoded at satellite receiver decoder 3 for distribution via modulator 5 over a distribution cable 6 to the interactive terminals 7, 8 or 9 of the present invention. Also, in accordance with the present invention, the satellite signal may comprise a signal continuously indicating the accurate time. Additionally, a band of cable television channels received over cable facilities 1 are received and, if necessary, descrambled at cable receiver/descrambler 4. The descrambled video signals are then modulated at modulator 5 for distribution over facilities 6 to interactive terminals 7, 8 or 9. If desired, an optional scrambler may be provided for scrambling premium channel transmissions to interactive terminals 7, 8, or 9. Of course, terminals 7, 8, or 9 then would comprise descrambler circuitry capable of descrambling the scrambled premium channel transmissions. Such circuitry is not shown in either FIGS. 1 or 2 but would be preferable in a system involving distribution of signals to remote subscriber locations.

According to the exemplary embodiment of FIG. 1, the hotel or hospital location may be connected to other hotels or hospitals via data link 14. Over data link 14, data may be received via modem 13 at system manager 12. In this manner, the hotel or hospital system manager may maintain current status of all features and all interactive terminals of an a system comprising a plurality of hotels. For example, entertainment schedules, room status data or wake-up information may be distributed over the data transmission link from a network control center where the entertainment schedule is composed. System manager 12 comprises a data processing unit and appropriate memory for storing status and features associated with all terminals in the system. System manager 12 also controls the generation of video channels at modulator 11, if necessary, for transmission over facility 6 to the two-way interactive terminals 7, 8 or 9. In particular, modulator 11 comprises the capability to generate signals for actuating the display of character screens at terminal locations responsive to the control of the system manager 12 in the event, for example, that terminals are unable to generate the character screens themselves.

The generation of complete screens of characters for transmission to a terminal according to the present invention for display is not required because the terminal (FIG. 2) comprises its own character generator 204. Consequently, locally generated video modulator 11 is optional. Instead, system manager 12 generates commands to generate screens, and not the screens themselves, for transmission via addressable transmitter 10 to an interactive terminal according to the present invention. In a "hybrid" system comprising terminals having no character generator and terminals according to the present invention, locally generated video modulator 11 would be necessary. The screens generated either at the terminal or by way of modulator 11, for example, may relate to the provision of information to guests or patients about hotel or hospital services, respectively.

Also according to FIG. 1, system manager 12 controls an addressable transmitter/receiver 10 for transmitting addressed communications which are uniquely addressed to terminals 7, 8 or 9 and receiving communications at random times or in response to polling requests of terminals. The addressable transmitter 10 according to FIG. 1 may transmit addressed information on a separate data carrier, for example, at 108 megahertz and receive information transmitted in a so-called upstream direction from the terminals on another separate data channel at 25 megahertz. In an alternative embodiment, all downstream communications may be transmitted in band or within a particular television channel transmission, for example, within the horizontal or vertical intervals of transmitted video signals. Consequently, the system manager 12 accomplishes in band signaling by controlling data input into the video signals transmitted via either modulators 5 or 11 (not shown). A separate data carrier for each direction of transmission may be preferred due to the increased data carrying capacity. For upstream transmission, a telephone line or spread spectrum transmission may be employed as an alternative to a separate data channel.

Besides specifically addressed data communications with interactive terminals 7, 8 or 9, system manager 12 may also communicate with billing computer (Property Management System) 20. In a hotel, for example, the billing computer may be used at the front desk for check-in and check-out of guests and for reservations. Wake-up alarms, or other warning alarms sounded by system manager 12 can be sent to billing computer 20. System data can also be displayed on monitor 15 or printed on printer 18. System data can also be permanently stored on disk 17. System manager 12 may also address communications globally to all interactive terminals which communications may or may not require a terminal to respond. Such global communications, for example, may be addressed to a global address representing all terminals in the particular hotel system or to a group address representing a group of terminals within the system having a commonality of interest.

Each room terminal can be addressed using long addresses, short addresses, global addresses and group addresses. Each room terminal preferably has a unique 23 bit long address preset at the factory and stored in non-volatile memory. This address will always be recognized by the room terminal. To minimize communications overhead, a 12 bit short address may be configured by the system manager. The short address would be treated identically to the long address. This address would be unique to a particular building site. All room terminals are programmed to recognize a special global address to aid in sending system-wide commands. Normally, no response is given the command sent to a global address. An internal flag will be set to indicate that a global command has been received. This flag may be used by the system manager to verify receipt of global configuration commands. In order to maximize system performance, a group address may be implemented. This would speed the sending of data to groups of room terminals that are to be configured identically. This address would be handled by the room terminal as a second global address. It would be dynamically assigned by the system manager and be transparent to the system operator.

Each room terminal will communicate with the system manager using a polling protocol. Preferably, the room terminals are configured as slaves to the system manager. Each room terminal responds to commands sent by the system manager. A normal polling cycle causes a room terminal to report its current operating mode including its current channel or screen. This allows the gathering of channel statistics by the system

manager. Additional information returned may include request by the room terminal for data resident in the system manager or information regarding commands initiated by keys pressed at the room terminal. The room terminal will also indicate upon polling by the system manager of a change in a normally monitored item such as that at the serial port. Besides normal polling cycles, additional information is available from the system manager on a request basis, including screen and configuration dumps. The polling communication between the room terminals and the system manager occurs on signals modulated at cable television frequencies such as EIA (Electronic Industries Association) television frequencies and other standard cable television frequencies. Further details are incorporated by reference to U.S. application Ser. No. 07/340,659 entitled "Terminal Polling Method."

Either the user of a terminal or an installer may configure and install their terminal themselves. Interactive terminals 7, 8 or 9 are, consequently, equipped with means for enabling automatic installation. Further details of automatic terminal configuration are provided in copending parent application Ser. No. 289,218 incorporated herein by reference.

Referring to FIG. 2, there is shown a two-way interactive terminal according to the present invention. The terminal is coupled via transmission link or facility 6 to video modulator 5, addressable transmitter/receiver 10, and locally generated video modulator 11, if provided, as shown in FIG. 1.

In particular, a two-way interactive terminal according to the present invention comprises an up/down converter 201 for converting channels received over the facility 6 for display at an associated television receiver (not shown) or for transmitting data modulated to 25 megahertz by data transmitter 203 for transmission over facility 6. Up/down converter 201 passes data on the separate data carrier at 108 megahertz for demodulation and reception at data receiver 203. Received television entertainment signals are provided by up/-down converter 201 to demodulator 202 which also provides automatic frequency control and gain control of up/down converter 201. Demodulator 202 provides video via on screen character generator 204 to channel $\frac{3}{4}$ modulator 205. In this manner, on screen character generation may appear superimposed upon an incoming video signal or displayed in the form of a teletext screen, for example, text on a plain colored background. Also at demodulator 202 the baseband audio channel is transmitted to audio output 211 or via channel modulator 205 to the television receiver at radio frequency. In addition, a baseband video output 213 may be provided from on screen character generator 204 at video output jack 213.

The interactive terminal of the present invention further comprises a processor 206 for controlling data transmission and reception at data receiver/transmitter 203. Processor 206 also controls character generation at character generator 204 via gate array 207. Also via gate array 207, the processor 206 controls a key pad 216 which may be directly coupled to the gate array or coupled via infrared or other remote control transmission link receiver 208. Random access memory (RAM) 217, provided with backup power by capacitor 218, stores character screen commands, downloaded feature data and other data received over the data transmission link via data receiver 203 from the system manager responsive to processor 206 control. The processor 206 also has access to nonvolatile random access memory 222 and access via gate array 207 to an outboard read only memory (ROM) 219. Processor 206 receives remote control key commands from a remote control key pad via infrared or other remote control transmission receiver 208. Processor 206 may also control the operation of a phase lock loop 209 and bandpass filter 210 for controlling operation of up/down converter 201.

Power is supplied via an alternating current input to power supply 215 which provides, for example, a plus 5 volt and a plus 12 volt DC input to various components of the terminal requiring such power. Furthermore, the alternating current power input to power supply 215 may be provided via a controlled switched outlet 214 to an associated device such as the television receiver associated with the terminal. The state of switched outlet 214 is controlled via gate array 207 by processor 206. For example, switched outlet 214 may continuously provide power to its associated device or provide power only when an "on" button of key pad 216 or a remote control key pad is set to an on condition.

Values inside of boxes or associated with boxes are exemplary of memory sizes, clock rates, or component types. For example, clock 220 for clocking the microprocessor operation may operate at 14.318 megahertz. The clock signal is divided down by gate array 207 for operation of microprocessor 206 which may be a Motorola MC 6803U4 or for clocking other processes of the terminal. The on screen character generator 204, for example, may be a Mitsubishi M50455 component. RAM 217 may comprise 16 kilobytes of memory and ROM 219 comprise 32 kilobytes of memory respectively.

FIG. 2 also illustrates wake-up alarm 230 preferably a piezoelectric beeper. Other types of audible alarms may be used. In addition to character generation and screen display, LEDs 221 may, for example, indicate at least a power on condition or, additionally, an alternative display of tuned channel number or other data which may be displayed on a screen.

Once the user of a room terminal applies power to power supply 215 of FIG. 2, processor 206 begins the task of initialization of various types of components of the terminal of FIG. 2. Processor 206 verifies proper operation and communication of components of the terminal such as data transmitter and receiver 203, gate array 207, on screen generator 204, keypad 206 and infrared remote control receiver 208. Self-initiated diagnostic routines well known in the art to verify proper software operation may be performed at processor 206. Processor 206 may also enter an optional manufacturing or factory testing mode. It may also enter a maintenance or display RAM mode of operation activated by the depression of a predetermined key of keyboard 216 or receipt of data entered via remote control receiver 208.

Upon power up of the room terminal, when a reset command is received from the system manager, the room terminal will go through a series of tests. The RAM and ROM memory and the watchdog will be exercised to ensure proper operation. Any problems detected will be reported by the room terminal to the system manager. In order to protect data stored in the RAM memory, the RAM test is non-destructive. Particular commands also allow the exercising of specific hardware functions to enable thorough factory testing. Specific tests may include test of the video generator, system RAM, the alarm, the keyboard, the data transmitter, and other hardware.

The present invention allows predetermined configurations of a limited number keys on keypad **216**, for example, seventeen different keys or a infrared remote control **208**. A key template is stored in terminal memory for each display to be generated. The template defines an operation for particular keys associated with a display. For example, various displays are illustrated which result in the generation of different displays in response to the actuation of particular keys. In response to FIG. **11**(*c*), the actuation of key "1" generates the display of FIG. **11**(*e*) and the actuation of key "2" generates the display of FIG. **11**(*d*). In such a fashion, any key can be configured for any function. For example, the "OK" key and the "BUY" key are configured for "if correct" and "to retry", respectively, in FIG. **11**(*g*). Therefore, by assigning new functions to existing keys "CH+", "CH−", "Vol+", "Vol−", "BUY", etc., the invention permits programmable assignment of functions to keys which may have little or no relationship to key labelling. Furthermore, by reinforcing the assigned key function by means of screen display, a user may feel comfortable with their selection of particular key for performing a non-indicated function. In other words, the combination of screen display and programmable keys creates a human friendly interface between the user or the installer and the terminal.

Room status or wake-up communication from a room terminal can be selected by tuning the room terminal to a particular channel number that corresponds to a desired data screen. When the particular channel corresponding to the desired data screen is selected, normal tuner output is disabled and the text generating circuitry of character generator **209** is activated. A first screen of text is then displayed on the television receiver associated with the room terminal for the selected service such as wake-up.

In addition to the interactive modes described, an option exists for a mode allowing data entry even when the room terminal is in the "power off" state. This will allow maid status entry, for example, without requiring a maid to turn on an associated television. When a room terminal is "off" a power LED will be off, switched outlet **214** may be turned off, and the tuner will be tuned to the "off" channel. Upon power up, switched outlet **214** will be switched "on" and the room terminal will be tuned to a predetermined channel or text screen. Switched outlet **214** can be configured either to be always on or to switch off when the room terminal is turned "off". The power-up channel can also be programmed as a configurable parameter by the system manager.

When a data screen is active, the terminal, under the control of processor **203** is capable of selecting an audio or video channel or both from up-down converter **201**. This audio/video channel can then complement the character generated display. Thus, music can be added to screens or even movie audio inserted over the screens. If no channel is specified for the audio, the volume control circuit of demodulator **202** is set to its minimum level. The volume control circuit of demodulator **202** will, however, remember the previous volume level and return to the previous volume level the next time an audio output is needed. Further details are incorporated herein by reference to U.S. application Ser. No. 07/342,987 entitled "Interactive Television Terminal with Programmable Background Audio or Video."

Processor **203** can control the audio volume control circuitry when requested by use of the volume up key, the volume down key and the mute key. Preferably, volume up and volume down will exhibit a total of 64 different levels. When one of these keys is pressed, the request will be repeated at a rate of about 100 msec. until the key is released. There will be an initial delay of about 500 msec. after the first step before the 100 msec. repeat has begun. Other rates and delays are within the purview of those of skill in the art. Mute will cause the volume to go down to the lowest level, but the previous level will be remembered. Pressing mute or volume up will cause the volume to return to the previous value. A volume up or down request may additionally be acted upon by the processor as desired. Volume up (down) will remain at the highest level (lowest) volume level once it is reached regardless of how many times the volume is up (down) key is subsequently pressed. When turned off, the room terminal will go to the lowest volume level. When turned back on, the room terminal will return to the previous volume level.

While text data is being displayed, the room terminal keys may be configured to behave in different manners as described above. A keystroke may cause a new page of data to be displayed and in turn reprogram the keys to a new set of actions corresponding to the new screen. This will be useful for implementing a menu type display. The key stroke or series of key strokes may be saved to be reported to the system manager. This is intended for functions needing verification from the system manager. Optionally, the digit keys may be echoed on the screen.

Periodically, the system manager will download screens into RAM **217** of a room terminal. Other screens will be permanently resident in the ROM **219** of a room terminal. The priority of screens will be determined by the system manager. If a screen for a requested function is not currently resident in a terminal's memory, the default screen will be displayed such as "please stand by . . . " while data is requested from the system manager. When the data is received it will be displayed. A channel number or the channel up, down or no buttons may be used to abort this sequence. Further details of the generation of character screens are incorporated herein by reference to U.S. application Ser. No. 07/340,731 entitled "Storage Control Method and Apparatus for an Interactive Television Terminal."

In this embodiment of service selection, specific unused channel numbers are assigned to identify particular features. For example, channel 76 would be assigned to the room status/inventory function and a unique feature start screen determined wherein either FIG. **1**(*a*) or FIG. **11**(*a*) is displayed. The unique feature start screen is displayed instead of an EIA (Electronic Industries Association) channel number. Furthermore, channel 77, for example, would be assigned to the wake-up feature wherein the screen of FIG. **14**(*a*) is displayed.

In an alternative service selection embodiment, a menu driven interface is displayed at the room terminal. For example, rather than assigning channels **76** and **77** as above, only channel 76 would be assigned to a service menu. Room status and wake-up could then be selected along with other features from the service menu.

A room terminal user preferably tunes to the particular above-mentioned channel for a particular service by pressing an identifier key corresponding to a particular EIA channel. The identifier key corresponds to the particular channel by a list stored in the room terminal's memory. For example, when the user pushes the "1" key, the list in memory can designate the key to EIA

channel 76 where the room status service is displayed. The list stored in the room terminal's memory is programmable by commands sent from the system manager, thus configuring particular keys to particular EIA channels.

FIG. 3 is an exemplary screen of tabulated room status information and menu selections. These screens are preferably displayed at system manager 12 or printed on printer 18. "Occupied" may be selected from the menu. When the user selects the "Occupied" option, the cursor is placed in the room box. If the user then enters a valid room name, the room specified is designated as "Occupied". Otherwise, an error message "invalid room" is displayed. "Vacant" can also be selected from the menu. When the user selects the "Vacant" option, the cursor is placed in the room box. If the user then enters a valid room name, the room specified is designated as "Vacant". Otherwise, an error message "invalid room" is displayed. "Clean" can also be selected from the menu. When the user selects the "Clean" option, the cursor is placed in the room box. The user then enters a valid room name, the room specified is designated as "Clean". Otherwise, an error message "invalid room" is displayed. The "Clean" designation signifies that a room has been cleaned by a maid, and that it is waiting to be inspected by a housekeeping supervisor. "Dirty" can also be selected from the menu. When the user selects the "Dirty" option, the cursor is placed in the room box. If the user then enters a valid room name, the room specified is designated as "Dirty". Otherwise, the error message "invalid room" is displayed. The "Dirty" designation signifies that a room has not been cleaned, or that the room has been inspected and rejected by the housekeeping supervisor. "Ready" can also be selected from the menu. When the user selects the "Ready" option, the cursor is placed in the room box. If the user then enters a valid room name, the room specified is designated as "Ready" Otherwise, an error message "invalid room" is displayed. The "Ready" designation signifies that the room has been cleaned, inspected, and accepted by the housekeeping supervisor. "Out-of-Service" can also be selected from the menu. When the user selects the "Out-of-Service" option, the cursor is placed in the room box. If the user then enters a valid room name, the room specified is designated as "Out-of-Service". Otherwise, an error message "invalid room" is displayed. The "Out-of-Service" status can be subsequently switched to either "Vacant" or "Occupied" at the discretion of the user and the room shall assume its last known status of "Clean", "Dirty", or "Ready". The above room status changes can also be stored on disk or sent to a central billing computer (Property Management System) if desire. The central billing can also print out the data if desired.

"View" can be selected from the main menu. When the user selects the "View" option, the cursor is placed in the room box. If the user then enters a valid room name, the screen page on which the specified room appears is displayed. Otherwise, an error message "invalid room" is displayed. The screen page corresponding to the specified room can display historical room status information including current status ("Occupied", "Clean", etc.), the name or ID of the maid who made up the room, the name or ID of the inspector who inspected the room, guest information, wake-up information or any other information on the system pertaining to the particular room viewed.

"Sort" can be selected from the menu. When the user selects the sort option, an alternate set of menu items appear as illustrated in FIG. 4. These menu items list room status conditions. The rooms can then be sorted by status condition and the rooms exhibiting a particular condition tabulated and illustrated as in FIG. 5. FIG. 5 illustrates a sort for all rooms exhibiting the "Dirty/Occupied" status condition. Note that rooms currently being cleaned have the "Dirty" status condition. Therefore, any sorting involving the "Dirty" status condition will have those rooms displayed as well, along with the highlighted inspector IDs.

When the room name is entered in the room box, a special name "All" can be entered to designate every room in the hotel/hospital. "All" is not a valid name when selecting the "View Room" option. A range of room names, such as 110–120, can also be entered into the room box, except when selecting the "View Room" option.

As described above, room status can be altered using the above described screens from the system manager. Futhermore, if these screens are available at the room terminals, room status can also be altered in a like fashion. In addition, a maid, by cleaning a room and logging into the room terminal of the present invention automatically alters the room status stored at the system manager from "Dirty" to "Clean". An inspector, after inspection of the room, will alter its status to either "Ready" or back to "Dirty". Further details of maid and inspector functions will be described below in conjunction with FIGS. **10**(*a*)–**10**(*c*) and **11**(*a*)–**11**(*k*). Furthermore, room status can also be altered from the central billing computer or any other interface to the present communication system if desired.

"Find Maid" can be selected from the menu. When the user selects the "Find Maid" option, the cursor is placed in the maid box as illustrated in FIG. 3. If the user then enters a valid housekeeper ID, the first occurrence of the screen page on which the specified maid appears is displayed. Otherwise, an error message "invalid maid" is displayed. If the housekeeper ID is not found (i.e., the specified maid is not actively cleaning the room) but has been active during the current day, the message "maid not active, last found in room XXX" will be displayed. Otherwise, only "maid not active" is displayed. If this maid is logged into several rooms simultaneously, the first occurrence is displayed. Other notices, for example, that a maid is not presently cleaning a room are also possible.

"Change IDs" can be selected from the menu. The screen of FIG. 6 is displayed when the user selects this option. The menu of items on the change ID screen of FIG. 6 are then possible. The user can select the "Add New Name" option and enter the employee name in the employee name box. Typically, the name will have a maximum character length. The system manager preferably treats the entire name as one string, and will not make any distinctions between first name, last name and middle initial. However, in an alternative embodiment, distinctions can be made between first name, last name and middle initial by treating them as more than one character string. When the user presses ENTER the cursor is placed in the authorization box. The user is then prompted to enter either "M" for "Maid" or "S" for "SUPERVISOR". The user is then prompted to enter a numeric code between the values of 0 and 999 inclusive into the identification box. Pressing "Esc" at

any time during the input sequence will abort the entire add new name operation.

"Change Name" can also be selected from the menu to change the name of an employee who has already been added. "Change Identification" can also be selected from the menu to change the identification number of an employee who has already been added. "Change Authorization" can also be selected from the menu to change the authorization level of the employee. Preferably, the authorization level is toggled between maid and supervisor. Additionally, other authorization levels besides maid and supervisor may be provided.

"View Name" can be selected from the menu to blank the data displayed in all three boxes and place the cursor in the employee name box. The user then enters the desired name. When the name is found, it is displayed along with its authorization identification number. Otherwise, the message "name not found" is displayed. A comparison is performed by searching to match the character string for the user entered in the employee name box with the named employee's character string stored in the system manager data base. For example, if the user typed in the string "Smith" then the names "Smith", "Smithy" and "Smithinski" would all be considered as matching. In the case of multiple matches the user will be given the chance to view the next occurrence. Also, the comparison process shall not be case sensitive. Alternatively, other comparison techniques known to those of skill in the art can instead be used.

"View Identification" can be selected from the menu to blank all three boxes displayed and place the cursor in the identification box. The user may then type in an ID and if the ID is found it will be displayed along with its name and authorization. Otherwise, the message "ID not found" is displayed. "Display IDs" can be selected from the menu of FIG. 3. When "Display IDs" is selected a screen similar to FIG. 7 is displayed. "Backup Log" can be selected from the menu of FIG. 3. When "Backup Log" is selected the system manager stores a backup of gathered historical data onto the disk.

FIGS. **10**(*a*)–**10**(*c*) illustrate the sequence of events a maid (housekeeper) will experience and FIGS. **11**(*a*)–**11**(*k*) illustrate the sequence of events an inspector (housekeeping supervisor) will experience on the screen of the television associated with a room terminal. When room status/inventory is selected by tuning to the room status channel on a room terminal or by selecting room status on a main menu at a room terminal, the screen of either FIG. **10**(*a*) or FIG. **11**(*a*) will be displayed. An access code is then entered. The terminal compares the entered access code with legitimate secret access codes for an inspector or for a maid stored in terminal memory. If the access code is for a maid, the screen of FIG. **10**(*b*) will be displayed; otherwise, if the access code is for an inspector, the screen of FIG. **11**(*b*) will be displayed.

In response to the screen of FIG. **10**(*b*), the maid then enters his or her housekeeper ID and begins cleaning the room. At this point the room status is automatically changed to "Occupied" or "Vacant" and being made up by a particular maid number. The start time of the maid's cleaning is also stored for maid timekeeping purposes. Furthermore, the location of the maid is stored for maid locating features. When the maid finishes cleaning the room any key can be pressed in response to FIG. **10**(*c*) and room status is changed to "Clean". The time the room is finished being cleaned is also recorded.

The time a maid starts and finishes cleaning a room can be tabulated in a maid timekeeping matrix as shown in FIG. **9**. The start time and finish time as well as the room number and maid number can be tabulated. This information can be stored as historical data on a disk or can be sent to the billing computer as desired. Time information for each maid can be sorted to determine the number of hours worked by a maid. This information can be tabulated by the system manager or the billing computer and analyzed to assist in maid scheduling activities. Furthermore, this information can be used in place of punch card timekeeping equipment for payroll purposes. Special screens can be used for input of sign-in and sign-out information at the beginning and end of a maids work day. Furthermore, special screens other than that of FIG. **9** and similar to that of FIG. **4** can be used for displaying and sorting maid time information. Time-keeping features, as discussed above for maids, can also be used for other employees such as inspectors, clerks, cooks, and bellhops or the like. In a hospital environment, the activities may be monitored for scheduling medicine delivery, hospital bed linen changing and the like. In addition to using the timekeeping information for payroll purposes, the timekeeping information may also be used for time/task efficiency studies.

Preferably, the system manager keeps a log of maid and time information and supervisor transactions similar to that of FIG. 7. A maximum of 31 daily housekeeping files are kept (i.e., for one month of historical data), although any number is possible. A new file will override its counterpart from a previous month.

While a maid is making up a room (i.e., room status is vacant, dirty or being cleaned), the room terminal can be programmed so that the television cannot be tuned to any television program or entertainment like distraction. Commands for initiating these features can be sent from the system manager to the room terminal where they are stored in RAM. Furthermore, these features can also be preset in ROM if desired.

In response to FIG. **11**(*a*), when the access code for inspection is entered, the screen of FIG. **11**(*b*) is displayed. After the housekeeping supervisor ID is entered, the housekeeping supervisor can select to approve/reject rooms or to display a list of rooms for inspection in accordance with FIG. **11**(*c*). An exemplary display of rooms to inspect is illustrated in FIG. **11**(*d*).

The selection of a single room or a range of rooms to approve/reject is selected from the display exemplified by FIG. **11**(*e*). After a single room is inspected, the room name is entered in accordance with the screen exemplified by FIG. **11**(*f*). After the room name is entered, a key configured for accepting the room, rejecting the room, retrying the room, etc. is selected in accordance with FIG. **11**(*f*). Rejected rooms are returned to the "Dirty" status and accepted rooms are given "Ready" status.

To inspect a range of rooms, the beginning of the range of rooms is entered in accordance with the screen exemplified by FIG. **11**(*g*) and the end of the range of the rooms is entered in accordance with the screen exemplified by FIG. **11**(*h*). The range of rooms can then be accepted, rejected or cancelled in accordance with the screen exemplified by FIG. **11**(*i*). If accepted, inspection continues with FIG. **11**(*k*) and if the range of

rooms is rejected inspection continues with the screen exemplified by FIG. **11**(*j*). Another range of rooms can then be selected, the supervisor menu can then be chosen or inspection can then be terminated.

When the list of rooms ready to inspect is selected in accordance with the screen exemplified by FIG. **11**(*d*), only nearby rooms instead of all rooms may be displayed. For example, rooms on the current floor, the two floors above and the two floors below the room terminal are displayed. If this data comprises more than one screen, the first screen that contains a room on the current floor will be the first one shown. The current floor is computed by using the room name and ignoring the two least significant digits. However, other schemes of determining current floor can be used. When computing the floors above and below, the thirteenth floor may be ignored because of the predominant custom in the United States of America. For rooms that exist with 13XX designations they will be shown, but they are assumed not to exist. Thus, if you are on floor 12, rooms ready for inspection on floors 10, 11, 12, 14, and 15 (and 13 if they exist) will be displayed. The rooms will always be shown in ascending numerical order. It may also be desirable to indicate the floor numbers on the screen in addition to the room numbers. This would prevent a supervisor from thinking that these are the only rooms in the entire building that need inspection. Furthermore, the number of floors above and below those displayed may also be altered such that all floors are displayed or particular floors for a particular supervisor ID are displayed.

FIG. **12** illustrates a screen tabulating wake-up information by room. The screen can be selected at the system manager in response to a main menu such as that of the screen exemplified by FIG. **8**. An "Add" wake-up room option can be selected where the cursor is placed in the room box and the user enters the room to be added to the wake-up system. The cursor then jumps to the time box where the user enters the time that the guest asks to be awakened. A "Delete" wake-up room option can be selected where the cursor is placed in the room box and the user enters the room to be taken out of the wake-up alarm system. The room may also be automatically taken out of the wake-up schedule when the alarm time matches the system clock. Wake-up times and add and delete information can be entered by the billing computer instead of by the user of the system manager. Furthermore, as will be described in conjunction with FIGS. **14**(*a*) and **14**(*b*), wake-up alarms times can be directly entered at the room terminal by a guest.

Wake-up alarm functions can be configured at the system manager as exemplified by the screen of FIG. **13** preferably displayed in response to the menu of FIG. **8**. Only the system manager can control configuration of alarm functions. The local configuration allows a backup in case one or more room terminals is in an inoperative or error condition. Such a problem could exist if the room terminal either did not receive the initial command to set up the alarm sequence or the room terminal is not responding, meaning it could be in a loss of power situation. Under either of these or related conditions, the system manager will beep, display a message and if desired, print on a printer the rooms needing manual wake-up calls. The system manager can also under either of these conditions, send a warning alarm to the central billing computer or to a room terminal at a bellhop's station or a room terminal near the front desk. The wake-up alarm pre-warning time can be set to a predetermined number of minutes in advance of the scheduled wake-up time. The system manager will indicate that manual wake-up calls, such as telephone calls, are necessary in lieu of automatic wake-up calls by the room terminal. For example, a room's wake-up time is set at 6:00 a.m. and the pre-warning time is 15 minutes, where at 5:45 a.m. if the set-top is in one of the error conditions, the beeping and warning message described above at the system manager is performed.

A desired alarm duration is set by the system manager as a "wake-up alarm still on warning time" according to the local configuration as exemplified by FIG. **13**. The wake-up alarm still on warning time is the number of minutes a particular guest has after sounding of the alarm to enter any key at the room terminal or a room terminal remote control to disable the alarm. If a guest does not disable the alarm before the end of the wake-up alarm still on warning time, the system manager will beep and display a warning message and can if desired, print a list of rooms needing personal wake-up calls. The system manager can also send a warning alarm to the billing computer or to a room terminal at a bellhop's office, a maid station or a room terminal near the front desk. A personal visit to the room may be desired in the instance the guest is a heavy sleeper or there has been an emergency such as the guest has had a heart attack. For example, if a room's wake-up time is 6:00 a.m. and the still on warning time is 15 minutes, then at 6:15 a.m. if the room terminal alarm is still active and the feature is enabled, the warning actions described are taken. This also may set the actual duration of the audible alarm in the room and reset the terminal to an idle, "alarm off" condition.

In the preferred environment, each room terminal has an internal real time clock. The real time clock is capable of keeping time on its own. However, for improved accuracy an update signal is globally sent by the system manager to the room terminals. This update signal is sent every minute by the system manager. The system manager receives time information preferably by satellite to calibrate its time clock. Thus, the system manager can be calibrated via satelite in accordance with an accurate time source such as the National Bureau of Standards. Consequently, if at any time the system manager is not in synchronization with such a standard, the system manager and the terminals which it serves may be automatically recalibrated.

For example, in the event of a power failure at the system manager but not at the room terminal, the internal clock of the room terminal will keep the time. In this event, wake-up calls can still be performed as programed at the room terminal location even though there is a power failure at the system manager.

In the event of a power failure at the room terminal, the room terminal will be unable to keep time or sound the wake-up alarm until power resumes. When power resumes at the room terminal, the system manager will send the update signals that should have been received during power failure. These update signals are preferably sent at a fast rate of one signal per 150 miliseconds. The room terminal will quickly add each minute lost during the power failure to regain the correct time. If a wake up call was programmed to occur during the power failure, the clock will increment through every minute during the power failure and thus sound the wake-up alarm when the programmed time is established during the incrementing.

The real time clock of the room terminal preferably is an interupt driven subroutine programmed with the microprocessor. However, alternative clock embodiments are possible. For example, the microprocessor can be a "dumb" clock whereby time is only incremented when an update signal is sent every minute by the system manager. In such an instance, in the event power fails at the system manager but does not fail at the room terminal, the time will freeze at the room terminal and not change until power is regained at the system manger. In an additional alternative embodiment, for example, a real time clock module can be used at the room terminal. This real time clock module would be similar to that used in a digital alarm clock. This real time clock module would be acurate enough, that update signals from the system manager would not be necessary, although may still be desired so that all rooms may be synchronized to the same clock.

FIGS. 14(*a*) and 14(*b*) illustrate the sequence of wake-up screens displayed on a television associated with a room terminal. The screen of FIG. 14(*a*) can be selected for display by entering a predetermined wake-up channel via the terminal's keyboard or, alternatively, by selecting wake-up on a main system menu or directory, for example, by tuning to channel 1. As indicated in FIG. 14(*a*), a guest can view the scheduled wake-up time. Pressing the "No" key displays the screen of FIG. 14(*b*). The display of FIG. 14(*b*) displays the current time in AM and PM format. The guest can clear the alarm to deactivate wake-up by pressing the "NO" key. The guest can set the alarm by pressing the "CH+" key. The numeric keys can then be used to input a new wake-up time. The "BUY" key can be pressed to toggle the wake-up time between AM and PM. In response to a polling request, after a new wake-up time is entered, the room terminal sends the wake-up time along with its room identification to the system manager. The "OK" key can be depressed to return the display back to the main system menu (or "directory") or a predetermined wake-up channel containing the display of FIG. 14(*a*). Alternatively, military time format can be configured by the system manager for use rather than AM and PM indicators.

The system manager configures the room terminal to either clear the wake-up setting or maintain the wake-up setting for the next day, after a wake-up alarm has been sounded. A room terminal is preferably configurable to respond according to one of four options when a wake-up alarm is sounded: option 1—clear any wake-up setting upon checkout; option 2—clear any wake-up setting upon checkin; option 3—never clear the wake-up setting; option 4—clear the wake-up setting after sounding the alarm.

What is claimed is:

1. Two-way interactive room terminal for communicating room status information with a system manager of a cable television system, the terminal comprising:

memory means for storing data for generating a plurality of predetermined character screens and for storing room status data, said character screen data comprising character screen commands and said room status data comprising room status information;

character generator means for generating character screens from the stored character screen data;

data entry means for entering room status information in response to at least one character screen;

two-way cable television transceiver means, for communicating with the system manager; and

control means for processing entered room status information, for controlling said memory means and said character generator means for composing at least one predetermined character screen related to room status information requiring a data entry response, and for further controlling said two-way transceiver means for communicating processed room status information with the system manager.

2. The two-way interactive room terminal of claim 1, wherein the at least one screen of characters comprises an indication of the entered room status information.

3. The two-way interactive room terminal of claim 2, wherein the at least one screen of characters further comprises an indication of rooms to be prepared for occupancy.

4. The two-way interactive room terminal of claim 2, wherein the at least one screen of characters further comprises an indication of rooms to be inspected.

5. The two-way interactive room terminal of claim 2, wherein the at least one screen of characters further comprises an indication of one or more of the following status indications: occupied, vacant, clean, dirty, ready, or out-of-service.

6. The two-way interactive room terminal of claim 1, wherein the at least one screen of characters indicates the location of at least one maid or inspector.

7. The two-way interactive room terminal of claim 1, further comprising a tunable up/down video converter, responsive to the control means, for tuning cable television channels for reception at a television receiver, and being further coupled to the transceiver means, for transmitting data to and receiving data from the system manager.

8. The two-way interactive room terminal of claim 1, wherein the data entry means comprises a remote control.

9. The two-way interactive room terminal of claim 1, wherein the data entry means comprises a keyboard.

10. The two-way interactive room terminal of claim 1, wherein at least one other display screen indicates functions assigned to said data input means.

11. The two-way interactive room terminal of claim 1, further comprising an on/off switch and an AC outlet controlled by the on/off switch, the terminal capable of data entry and communication with the system manager regardless of the state of the on/off switch.

12. Two-way interactive room system comprising:

at least one room terminal comprising an audible wake-up alarm, a keyboard having at least one key, and a two-way transceiver for communicating data comprising at least wake-up data at cable television frequencies, the wake-up data comprising the time the audible wake-up alarm is to be activated;

a system manager comprising a two-way transceiver for communicating at least the wake-up data with at least one room terminal at cable television frequencies; and

a television transmission link for connecting the transceivers of the system manager and the at least one room terminal.

13. The room system of claim 12, wherein the two-way transceiver of the at least one room terminal sends a wake-up alarm responded to signal at cable television frequencies over the television transmission link to the system manager two-way transceiver upon actuation of

the at least one key of the keyboard of the room terminal to turn off the audible wake-up alarm.

14. The room system of claim 13, wherein the system manager indicates a first warning condition if a predetermined warning time after the activation of the audible wake-up alarm has lapsed and said wake-up alarm responded to signal has not been received.

15. The room system of claim 13, wherein the system manager indicates a second warning condition at a predetermined pre-warning time before a scheduled alarm time if a room terminal is incapable of activating the audible wake-up alarm at the scheduled alarm time.

16. The room system of claim 13, wherein scheduled alarm times may be entered at the keyboard of the room terminal or at the system manager.

17. The room system of claim 14, wherein the predetermined warning time may be entered at the system manager.

18. The room system of claim 12, wherein the at least one room terminal responds to polling signals from the system manager.

19. The room system of claim 12, wherein the at least one room terminal further comprises a character generator for generating at least one display of characters related to wake-up data.

20. Two-way interactive room terminal for communication of wake-up information with a system manager of a cable system, the terminal comprising:

- a processor for processing data, the data comprising wake-up data, the wake-up data comprising wake-up time information;
- a memory associated with said processor for storing the wake-up data;
- a keyboard for inputting wake-up information to the terminal;
- an audible wake-up alarm, responsive to the processor and the processed wake-up data;
- a character generator, responsive to the processor, for generating at least one display screen of characters related to wake-up time information requiring keyboard response; and
- a two-way cable television transceiver, responsive to the processor, for communicating wake-up information with the system manager.

21. The two-way interactive room terminal of claim 20, wherein the at least one screen of characters indicates entered wake-up information.

22. The two-way interactive room terminal of claim 20, wherein the room terminal sends a wake-up alarm responded to signal to the system manager upon activation of at least one key on the keyboard to turn off the audible wake-up alarm.

23. The two-way interactive room terminal of claim 22, wherein the system manager indicates a first warning condition if a predermined warning time after the activation of the audible wake-up alarm has lapsed and said wake-up alarm responded to signal has not been received.

24. The two-way interactive terminal of claim 20, wherein the system manager indicates a second warning condition at a predetermined pre-warning time before a scheduled alarm time if a room terminal is incapable of activating the audible wake-up alarm at the scheduled alarm time.

25. The two-way interactive room terminal of claim 20, wherein scheduled alarm times may be entered at least at the keyboard of the room terminal.

26. The two-way interactive room terminal of claim 20, wherein the two-way cable television transceiver communicates with the system manager at cable television frequencies.

27. The two-way interactive room terminal of claim 20, wherein the room terminal responds to polling signals from the system manager.

28. The two-way interactive room terminal of claim 20, further comprising a tunable up//down video converter, responsive to the processor, for tuning cable television for reception at a television receiver and, being further coupled to the transceiver means, for transmitting data to and receiving data from the system manager.

29. The two-way interactive room terminal of claim 20, further comprising a real time clock, said audible alarm being further responsive to said real time clock.

30. The two-way interactive room terminal of claim 29, wherein said system manager receives time calibration signals from a satellite and periodically sends time update signals to said room terminal.

31. The two-way interactive room terminal of claim 20, wherein the character generator generates a display screen indicating functions assigned to keys on the keyboard.

32. The two-way interactive room terminal of claim 20, further comprising an on/off switch and an AC outlet controlled by the on/off switch, the terminal capable of keyboard entry and communication with the system manager regardless of the state of the on/off switch.

33. The two-way interactive room terminal of claim 20, wherein the keyboard comprises a remote control.

34. A method of communicating room status information between a room terminal at a particular room location and a system manager of a cable television system, the method comprising the steps of:

- a. receiving data at the system manager transmitted from the room terminal indicating a particular employee has begun work at said particular room location at a first point in time when the work begins;
- b. storing at the system manager a label for the particular room location and a label for the particular employee with data indicating said first point in time;
- c. receiving data at the system manager transmitted from the room terminal indicating work completion at said particular room location at a second point in time when the work is completed, said second point in time occurring after said first point in time; and
- d. storing at the system manager data indicating said second point in time.

35. The method of claim 34, wherein step b. further comprises the step of storing a status of dirty with said labels and step d. further comprises the step of changing said status of a particular room location from dirty to clean.

36. The method of claim 35, further comprising the steps of:

- e. receiving at the system manager inspection data transmitted from a room terminal indicating inspection of a particular room location; and
- f. storing at the system manager said inspection data for a particular room location.

37. The method of claim 36, wherein said inspection data indicates whether said particular room location has

a ready or a dirty status, and wherein step f. further comprises the step of changing said status for said particular room location to the ready or the dirty status indicated by said inspection data.

**38.** A method of communicating accurate time information between a room terminal and a system manager of a cable television system, said system manager having an internal clock, the method comprising the steps of:

a. periodically receiving at the system manager accurate time data sent from a satellite; and

b. transmitting a time update signal from said system manager to said room terminal.

**39.** The method of claim **38** further comprising step of the calibrating said system manager internal clock from the periodically received accurate time data.



**40.** A method of communicating accurate time information between a terminal and a system manager of a cable television system, both said room terminal and system manager having internal clocks, the method comprising the steps of:

a. periodically receiving at the system manager accurate time data sent from a satellite; and

b. transmitting a time update signal from said system manager to said room terminal.

**41.** The method of claim **40** further comprising the calibration of said system manager internal clock after periodically receiving accurate time data.

**42.** The method of claim **41** further comprising step of the calibrating said room terminal internal clock after receiving the time update signal.

* * * * *

# UNITED STATES PATENT AND TRADEMARK OFFICE
# C IFICATE OF CORRECTION

PATENT NO. : 4,994,908 

DATED : February 9, 1991

INVENTOR(S) : Curt M. Kuban et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the drawings, Sheet 1, Figure 1, the following elements should be shown;

a box labeled as MONITOR 15 should be shown connected to the box labeled HOTEL/HOSPITAL SYSTEM MANAGER 12 with a single connecting line;

a box labeled as KEYBOARD 16 should be shown connected to the box labeled HOTEL/HOSPITAL SYSTEM MANAGER 12 with a single connection line;

a box labeled as DISK 17 should be connected to HOTEL/HOSPITAL SYSTEM MANAGER 12 with a single connection line;

a box labeled as PRINTER 18 should be connected to the box labeled HOTEL/HOSPITAL SYSTEM MANAGER 12 with a single connection line; and

a box labeled BILLING COMPUTER 20 should be connected to the box labeled HOTEL/HOSPITAL SYSTEM MANAGER 12 with a single connection line.

In the drawings, Sheet 2, Figure 2, the following elements should be shown:

a box labeled SERIAL PORTS 229 should be connected to the box labeled GATE ARRAY 207 with a single connection line; and

# UNITED STATES PATENT AND TRADEMARK OFFICE
# CERTIFICATE OF CORRECTION

PATENT NO. : 4,994,908



DATED : February 9, 1991

INVENTOR(S) : Curt M. Kuban et al

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

a box labeled ALARM 230 should be connected to the box labeled GATE ARRAY 207 with a single connection line.

In the drawings, Sheet 2, Figure 2, COP 218 should read CAP 218.

Signed and Sealed this

Twenty-ninth Day of December, 1992

*Attest:*

DOUGLAS B. COMER

*Attesting Officer* *Acting Commissioner of Patents and Trademarks*

## Disclaimer

4,994,908—Curt M. Kuban, Snellville; Jeffrey C. Ting, Lawrenceville; Fitzroy E. Williams, Lawrenceville; Lee R. Johnson, Lawrenceville; Elizabeth A. Smith, Cumming; Howard L. Myers, Lawrenceville, all of Ga. INTERACTIVE ROOM STATUS/TIME INFORMATION SYSTEM. Patent dated February 19, 1991. Disclaimer filed November 25, 1997, by the assignee, Scientific-Atlanta, Inc.

Hereby enters this disclaimer to claims 38, 39, 40, 41, and 42 of said patent.

*(Official Gazette, May 8, 2001)*

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# United States Patent [19]

Crawford, Jr.

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[45] Date of Patent: Jul. 19, 1994

[54] MEDICAL MONITOR SYSTEM

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[21] Appl. No.: 922,577

[22] Filed: Jul. 30, 1992

[51] Int. Cl.$^5$ .............................................. G06F 15/42

[52] U.S. Cl. .......................... 364/413.02; 364/413.01; 364/413.03

[58] Field of Search ...................... 364/413.03, 413.02, 364/413.01

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[57] ABSTRACT

A medical monitoring system in which a plurality of vital signs monitors for a plurality of patients provide data on a continuing basis to a central server which in turn provides supervisory screen display that indicates the normal status or varying levels of alarm status of individual patients. The system permits an overview display of a floor and also provides a zoom-in display of an individual site patient together with an indication of a limited number of vital signs and a warning alarm signal when any one or more vital signs is outside of a first warning set of predetermined limits or a more critical alarm set of predetermined limits.

18 Claims, 7 Drawing Sheets

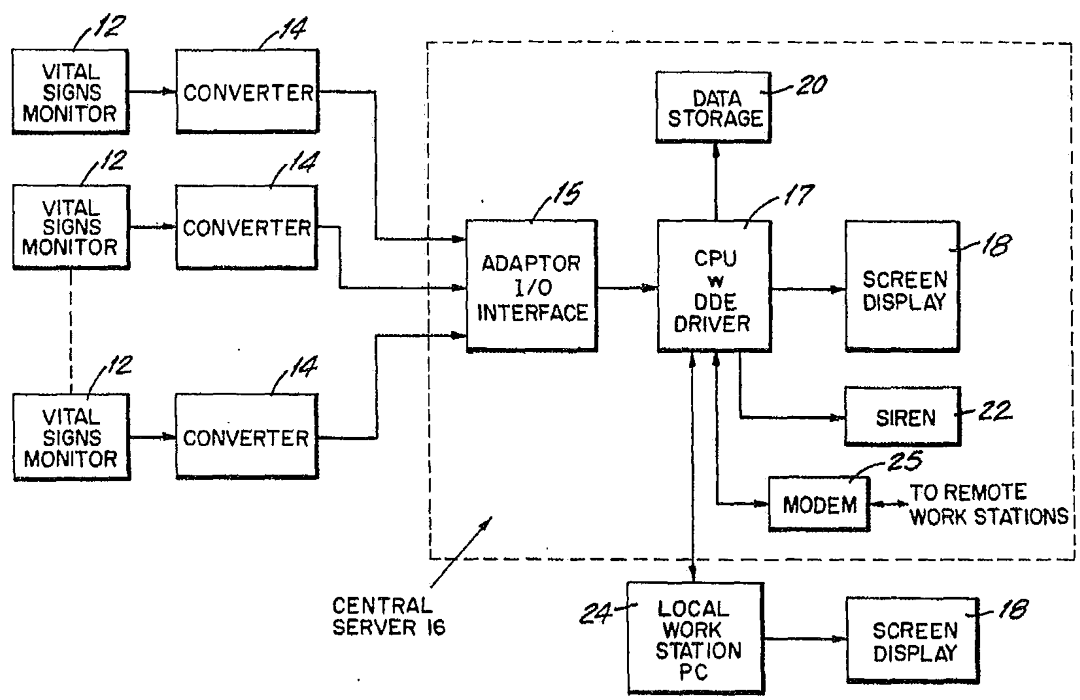


**EXHIBIT D**

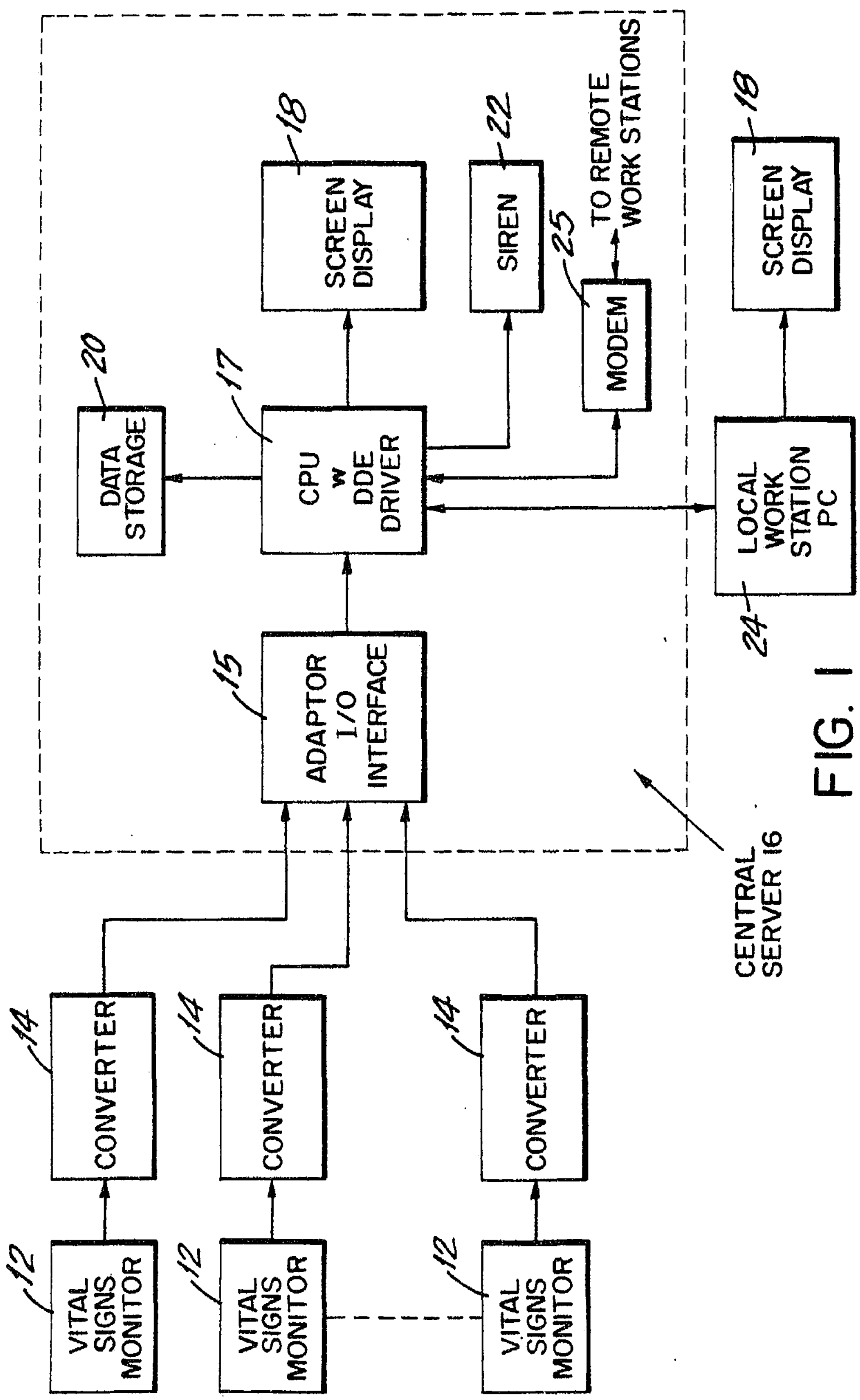
VITAL SIGNS MONITOR
12
CONVERTER
14
ADAPTOR I/O INTERFACE
15
CPU w DDE DRIVER
17
DATA STORAGE
20
SCREEN DISPLAY
18
SIREN
22
MODEM
25
TO REMOTE WORK STATIONS
LOCAL WORK STATION PC
24
CENTRAL SERVER 16

FIG. 1

OVERVIEW SCREEN
NORMAL CONDITION

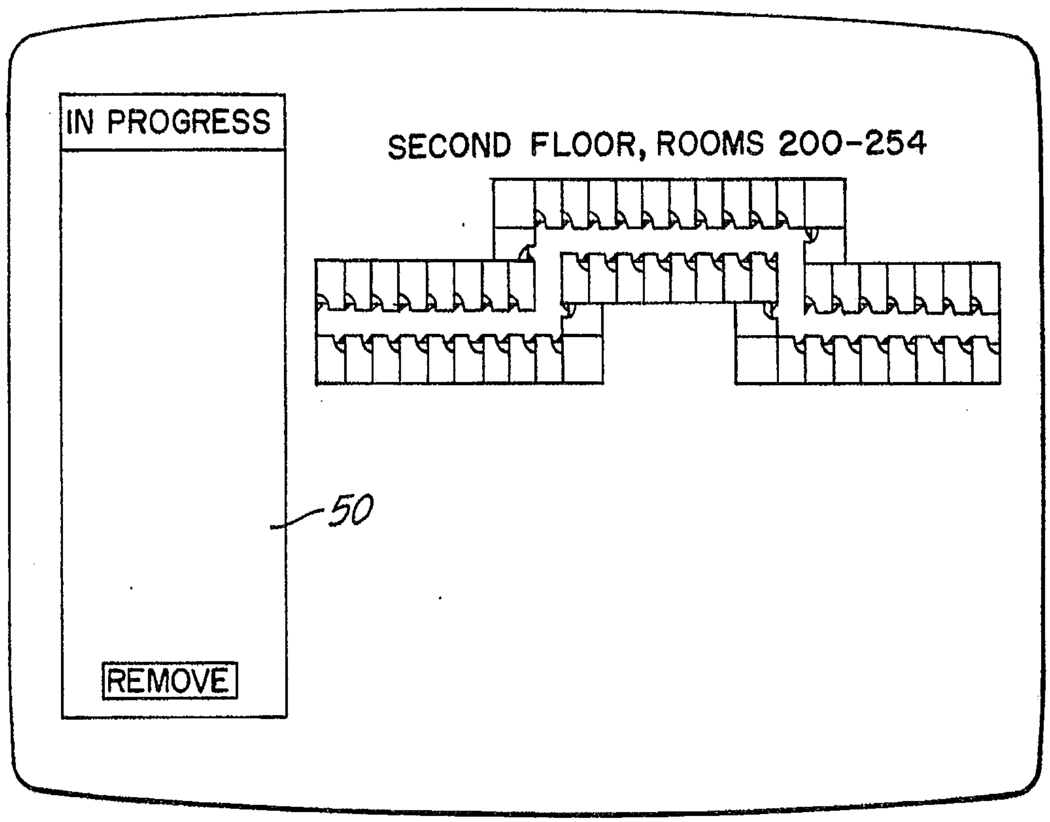


FIG. 2

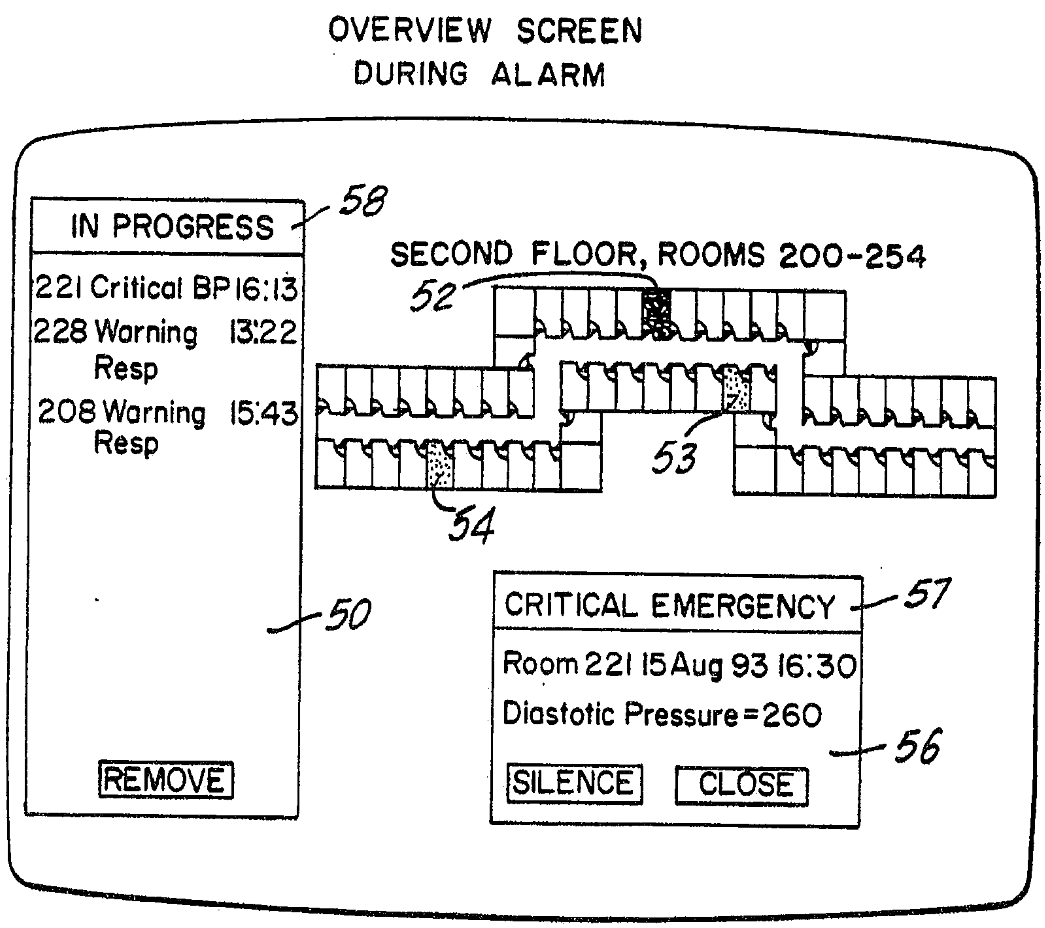
OVERVIEW SCREEN
DURING ALARM
IN PROGRESS
58
221 Critical BP 16:13
228 Warning Resp 13:22
208 Warning Resp 15:43
REMOVE
50
SECOND FLOOR, ROOMS 200-254
52
53
54
CRITICAL EMERGENCY
57
Room 221 15 Aug 93 16:30
Diastotic Pressure=260
56
SILENCE
CLOSE

FIG. 3

INDIVIDUAL BED SCREEN
NORMAL CONDITIONS

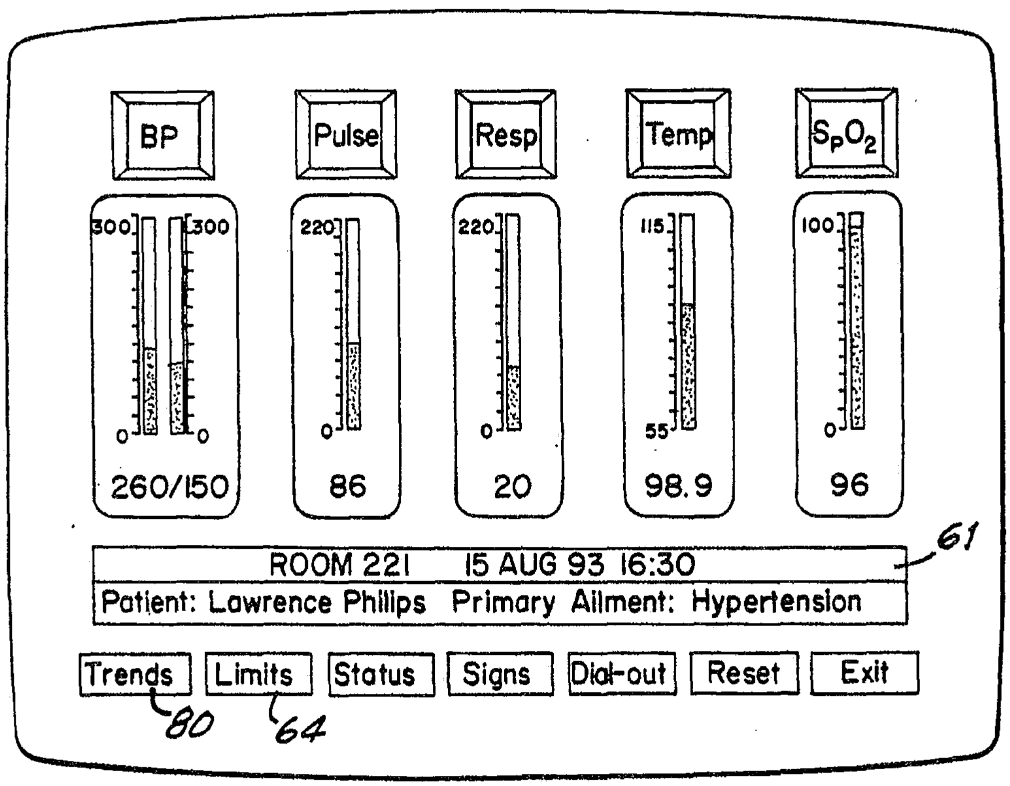


FIG. 4

INDIVIDUAL BED SCREEN
DURING ALARM

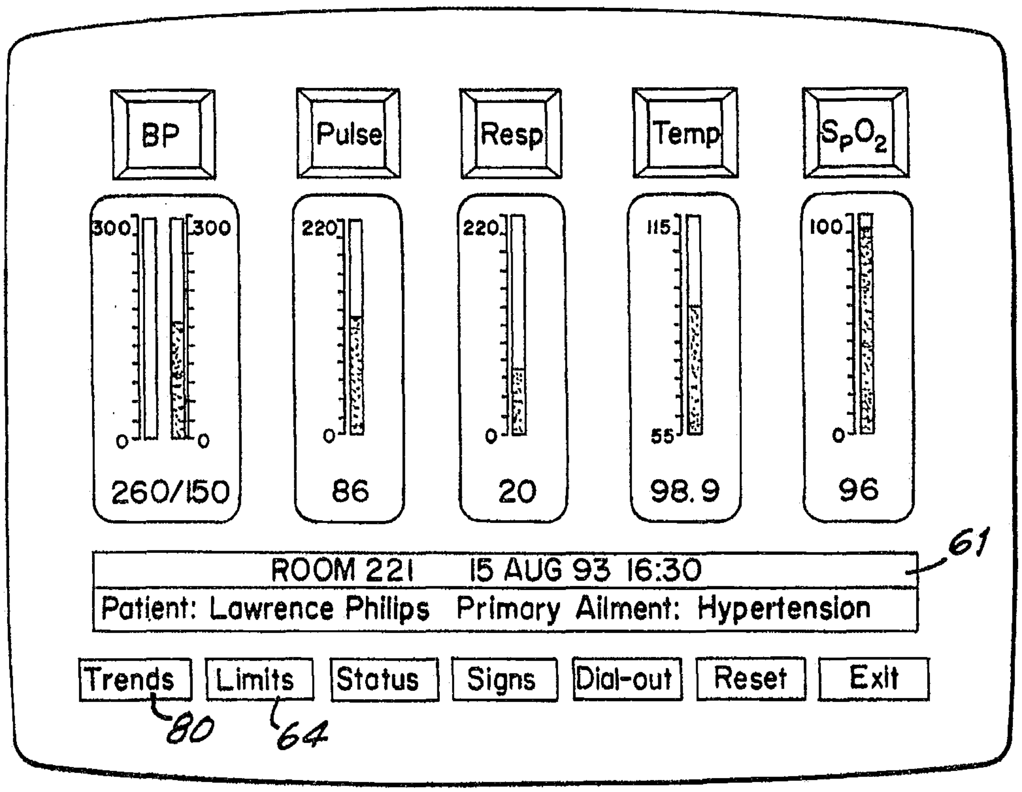


FIG. 5

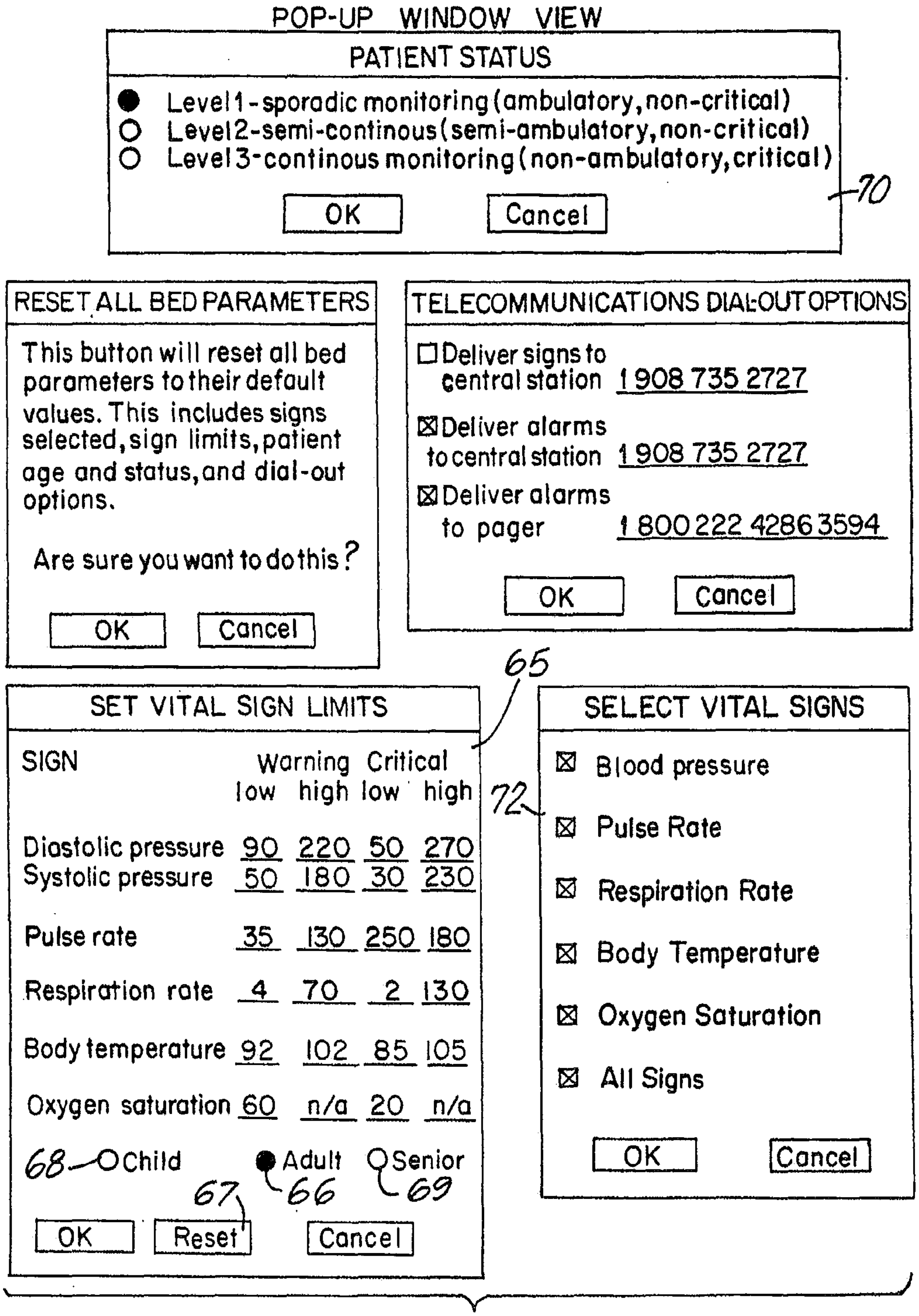
POP-UP WINDOW VIEW
PATIENT STATUS
Level1-sporadic monitoring(ambulatory,non-critical)
Level2-semi-continous(semi-ambulatory,non-critical)
Level3-continous monitoring(non-ambulatory,critical)
OK
Cancel
70
RESET ALL BED PARAMETERS
This button will reset all bed parameters to their default values. This includes signs selected, sign limits, patient age and status, and dial-out options.
Are sure you want to do this?
OK
Cancel
TELECOMMUNICATIONS DIAL-OUT OPTIONS
Deliver signs to central station 1 908 735 2727
Deliver alarms to central station 1 908 735 2727
Deliver alarms to pager 1 800 222 4286 3594
OK
Cancel
65
SET VITAL SIGN LIMITS
SIGN
Warning Critical
low high low high
Diastolic pressure 90 220 50 270
Systolic pressure 50 180 30 230
Pulse rate 35 130 250 180
Respiration rate 4 70 2 130
Body temperature 92 102 85 105
Oxygen saturation 60 n/a 20 n/a
68
Child
Adult
Senior
67
66
69
OK
Reset
Cancel
72
SELECT VITAL SIGNS
Blood pressure
Pulse Rate
Respiration Rate
Body Temperature
Oxygen Saturation
All Signs
OK
Cancel

FIG. 6

TRENDS WINDOW VIEW

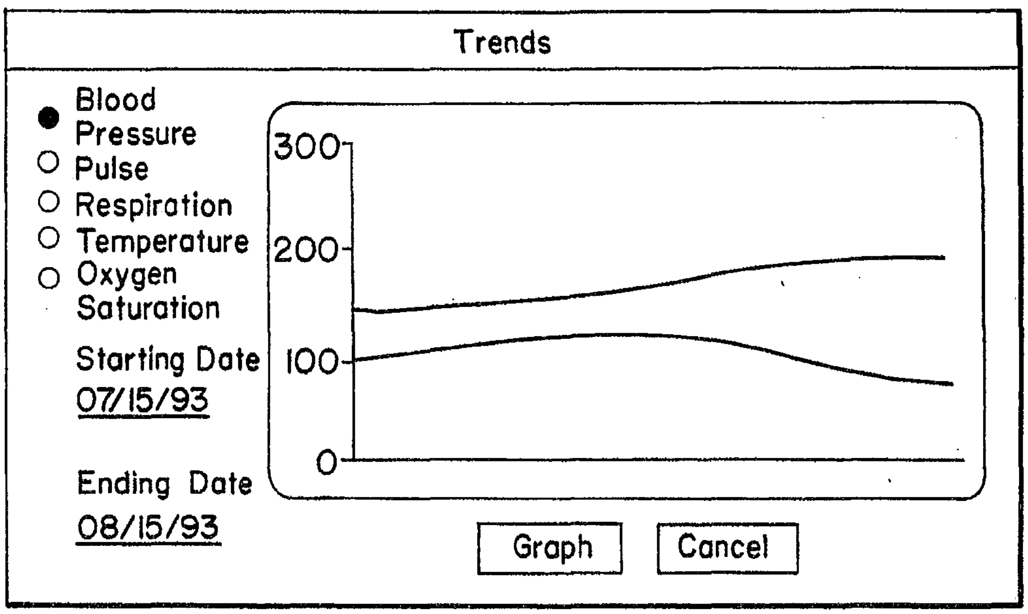


FIG. 7

# MEDICAL MONITOR SYSTEM

## BACKGROUND OF THE INVENTION

This invention relates to, in general, a supervisory system that monitors the vital signs of patients at home or in a health-care facility.

There is currently no cost effective means of continuously supervising an entire building full of patients from a central point. Accordingly, several problems have developed with patient care. When an emergency situation develops, it must be detected by supervisory staff before it can be dealt with. After detection, the response to emergencies can only occur after the proper professionals have been informed, and the problem is diagnosed. This process can take from several minutes to several hours, even in a fully-staffed hospital. There is no feasible way to employ the number of staff required to effectively supervise patients located in hundreds of separate rooms throughout a facility.

The inability to record the vital signs of patients (located outside Intensive Care Units) on a 24-hour basis leads to problems with medical analysis. Individual readings can be missed or conducted improperly, leading to inaccurate interpretation of results. Lengthy time intervals between readings increase the probability that smaller trends will be missed, and that errant readings will alter results. Difficulties in manually storing and retrieving the results of hundreds or thousands of tests make it nearly impossible to examine several consecutive weeks or months of a patient's vital signs.

When a substantial distance, such as several miles, separates a doctor from his or her patients, all these problems increase by several magnitudes. Outpatients are rarely examined more than a few times a week, so their medical emergencies often go entirely undetected. When outpatient problems are discovered, it takes several times longer for the proper personnel to diagnose and respond to the condition than it would for inpatients. Medical trend analysis is also much less effective and accurate for outpatients.

Existing electronic means of patient monitoring have been developed to avoid such difficulties, such systems typically consist of high-cost intelligent patient monitors linked together in local area networks. However, because of design and capability limitations, these systems do not serve as feasible, cost-effective, facility-wide central monitoring systems. They are typically more suited for limited numbers of patients requiring specific services.

Current solutions generally suffer from several shortcomings. The high cost of these systems prohibits the purchase of sufficient resources to monitor entire health-care facilities, or renders such purchases as non cost-effective. They do not have the power to effectively supervise large numbers of patients simultaneously, especially over expansive geographic areas. They do not provide the flexibility needed to account for various levels of patient mobility, to easily and quickly re-distribute resources such as patient monitors to new locations, or to efficiently upgrade system capacity as technology improves. Existing systems are difficult for non-technical personnel to learn and operate, and they do not provide the fault-tolerance for operator error/abuse and equipment failure which is needed in a critical medical application. Furthermore, the selection and presentation of the data gathered by these systems does not facilitate the effective supervision of large numbers of patients.

A major purpose of this invention is to provide a system which provides an optimum selection of data to be presented and optimum arrangement of that data so as to make feasible and useful the monitoring of a large number of patients in a fashion that increases the likelihood and enhances the ability of having an immediate response to conditions which require immediate response.

Another purpose of this invention is to employ known, low-cost, standard types of units, in a configuration which provides the capacity to monitor large numbers of patients, allows for the flexible, dynamic distribution of resources, provides sufficient fault-tolerance, and permits the efficient upgrade of system components as component design increases capacity of data handling, sensitivity, and scope of vital signs monitored.

More specifically, it is a purpose of this invention to 1) provide earlier detection and diagnosis of medical emergencies, 2) provide better warning and notification of patient emergencies, 3) reduce the time interval between readings of vital signs, 4) reduce the number of staff required to supervise patients, 5) provide better historic records of vital signs, 6) allow greater accuracy in medical trend analysis when compared to present methods, and 7) to provide the above at a cost which makes it feasible for an institution to adopt the system.

## BRIEF DESCRIPTION

This invention gathers data on patient vital signs using portable bedside medical monitors. As the data is collected, it is sent to a central computer.

Using the computer, users can examine the current or past vital signs of any patient simply by selecting the patient's room from a geographic facility map displayed on a computer screen (CRT). The system will also alert users when the monitored signs of any supervised patient go above or below preset limits. Should such conditions occur, the system will flash a warning display on its CRT describing the emergency. The system also illustrates the location of the emergency by highlighting the proper room on the facility map.

With the emergency located on a overview floor screen, the attendant can select an individual bed or site screen which provides more detailed information on the patient having the emergency.

Other options for notification of patient emergencies include paging doctors and nurses with alphanumeric pagers, and dialing out over telephone lines to alert external parties. This feature enables doctors or other healthcare professionals in a central building to supervise patients in remote facilities, or even their own homes. This invention can also transmit live video of outpatients over telephone lines, for doctor viewing.

Workstations allow users located away from the main computer to have access to all system functions. Patient data is stored at regular intervals, allowing future retrieval of readings, and detailed medical trend analysis.

This system allows one person to monitor the vital signs of hundreds of patients located in separate rooms on various floors of a facility, substantially reducing the number of staff required for such a purpose. Because the location and exact condition of monitored emergencies are known the instant problems are detected, effective response time to medical emergencies is substantially reduced. The system's abilities to display and graph all past readings (taken 24 hours a day) makes the analysis

of vital signs and medical trends much more effective and accurate. These benefits are several magnitudes greater for patients located in other buildings or other towns, since distance and lack of supervisory staff compound problems with analysis of medical trends, detection of emergencies, and response time to those emergencies.

## BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 is a block diagram of the overall system arrangement of this invention.

FIG. 2 illustrates a typical screen display which provides an overview of a floor in a hospital under normal conditions.

FIG. 3 is an illustration similar to that of FIG. 3 illustrating one critical alarm situation and two warning alarming situations.

FIG. 4 illustrates a typical screen display of a particular patient site on the floor represented by FIG. 3 under normal conditions.

FIG. 5 is similar to FIG. 5 except that it shows a critical alarm situation at the patient site.

FIG. 6 illustrates various windows which can be called up by the user to facilitate user selection of options and modification of operating parameters.

FIG. 7 illustrates a trends window which can be called up by the user to illustrate long term patient parameter trends.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in FIG. 1, a plurality of vital sign monitors **12** are coupled through converters **14** to a central server **16**. The central server **16** essentially consists of a fault tolerant PC compatible central processing unit **17** (CPU) with appropriate programming including a DDE driver, monitoring application software and preferably a remote control communication software. At the central server **16**, a screen display **18** is provided and is a critical part of the system of this invention. The screen display is what provides the appropriate selected information to facilitate response to various out of normal range conditions. The screen displays are described in greater detail in connection with FIGS. **3** through **8** herein. A data storage **20** is employed to store data so that it can be retrieved and reviewed for analysis that is deemed appropriate. An audible alarm and in particular a siren **22** responds to the CPU **17** comparing an input vital sign signal and finding that it is out of limits for patients requiring continuous or semi-continuous monitoring. The less severe situations do not trigger the siren **22**.

Further as indicated in FIG. 1, the output of the CPU **17** can be sent to other stations **24** either in the same hospital or over a modem **25** to other locations. At these other stations, a remote server is located with its screen display **18** and, if desired, a siren. It is more efficient for there to be a single data storage **20** which stores all the information in the system. Data can also be received from other locations such as homes and nursing homes.

The Dynamic Data Exchange (DDE) driver is a program incorporated in the CPU **17** that allows communication with other devices and in particular provides a data distribution function in addition to support for the peripheral devices. The DDE driver program sends local digitized patient data to the monitoring program in the CPU **17** of the central server and to local work stations **24** and remote work stations. The DDE driver also provides ability to send commands from the CPU **17** to the various monitors **12**. The DDE only communicates changes in data, thereby avoiding redundant transmissions.

Each medical monitor **12** comes with a standard output plug known as a RS232 plug to provide data appropriate to the central server **16**. A standard converter **14** is employed which is known as a RS232 to RS485 interface converter. It is a commercially available item. It is plugged into the output of each medical monitor **12**. The output of this converter **14** is transmitted in digital form over a two wire data grade telephone cable to an RS485 adapter at the input of the central server **16**. In a preferred embodiment, a card is employed which has sixteen RS485 adapters on it as an input/output interface **15** to the CPU **12**. Each RS485 on the card can connect to **32** telephone line pairs and thus to **32** medical monitors **12**. Accordingly, the interface card **15** employed permits the central server **16** to receive continuous communication from up to 1,024 medical monitors **12**.

It is contemplated that in a preferred embodiment, it might be possible to redesign a standard medical monitor **12** so that its output is compatible with the RS485 plug input to the central server **16** and in such a case the commercially available RS232 to RS485 converter **14** would not be needed.

Any one of a number of general purpose, multiparameter portable or even non-portable monitor devices can be employed at each station to provide the multiple signals indicating the multiple vital signs being measured. One such device is sold by Datascope Corporation of 580 Winters Avenue in Paramus, N.J. under its trademark Passport.

Such multi-parameter monitoring devices can be selected to provide entirely non-invasive monitoring or a combination of non-invasive and invasive monitoring. The six vital signs are systolic, diastolic, pulse, respiration, temperature, and oxygen saturation. The sensors for these signs also make wave-forms and EKG readings available to user and/or server.

The interface converter **14** is manufactured by Black Box Corporation and another model is also made by South Hills Datacom. The RS485 interface which constitutes the individual components of the adapter **15** is manufactured by Quatech or by Emulex.

The CPU **17** incorporates a DDE driver which is a known type of device; one of which is the Texas Instruments Direct Driver RS-232. Another example of the DDE driver is the Siemans 3964R and the GE-FANU CC M2 Serial Port.

The CPU **17** itself can be an 80486 series PC-Compatible CPU with super VGA graphics card, super VGA touch-screen monitor, mouse, keyboard, sixteen megabytes of RAM and a minimum of two-hundred megabytes of hard drive together with a two gigabyte read-write laser disk drive. This laser disk drive need only be employed with the CPU **17** at the central server **16** and need not be employed with a local workstation PC **24** or remote workstation PCs.

The modem **25** can be a standard 14,400 bps V-32 bis modem.

The application program for this invention can be created by use of a process graphics software such as the InTouch software available from Wonderware Software Development Corporation of 16 Technology Drive in Irvine, Calif. With the InTouch software resident in the CPU **17**, the user can generate the particular

screen display arrangement shown in FIGS. 2 through 7 or any variation thereon. The techniques of generating the program for the particular screen displays illustrated herein are techniques that are known to those skilled in the art who employ a process graphics software package such as InTouch. The process graphics software remains resident in the CPU 17 as part of the applications operating system so that data from the monitors 12 can be applied to affect the screen displays 18 discussed in connection with FIGS. 2 through 7. An adequate set of programing instructions are set forth under an Appendix at the end of this specification.

Critical to the utility of this system in providing an enhanced degree of patient supervision are the displays made available on a display screen 18 at the central server 16 as well as on display screens that are in any remote work stations.

FIGS. 2 through 7 illustrate the displays made available. FIG. 2 shows a typical overview screen display in which a floor arrangement is shown with each room or site indicated by icons which are mapped to simulate the geometry of the floor. FIG. shows the overview screen when there is an alarm condition. Two windows are provided. The In Progress window 50 (having the titile bar 58) lists all alarms from the Notification States 1, 2 and 3 discussed below in connection with FIG. 6. The Notification States are a function of patient status and alarm severity. The window 50 lists alarms as a function of importance (the higher Notification States first) and within a Notification State in time sequence of occurrence. The window 50 provides an indication of the site or room involved and whether or not the out of limits situation is critical or if less serious indicates "warning". The In Progress window 50 also lists the nature of the vital sign which is out of limits and the time of occurrence.

As shown in FIG. 3, showing, Room 221, shown at reference number 52, has a critical blood pressure out of limits situation which occurred at 16:30 hours. Similarly, Room228, shown as reference number 53, has a warning out of limits situation (less serious than critical) with respect to the patient's respiration and that occurred at 13:22 hours. Room 208, shown at reference number 54, has a warning out of limits respiration problem that occurred at 15:43 hours.

On the same FIG. 3 screen, the Critical Emergency window 6 provides somewhat more detailed information concerning the critical situation in Room 221 and in particular shows that the blood pressure problem is that diastolic pressure is at 260. Because the critical emergency situations are accompanied by an audible siren, the FIG. 3 pop-up window 56 provides a touch zone designated "Silence" which permits the user to turn off the siren. The pop-up window 56 is an alarm window and will have the title "Critical Emerging" or "Off-Line Emergency" or "Warning Condition" as a function of the nature of the alarm.

Each window 50, 56 has a touch zone, "Remove" or "Close" to either remove all of the data in the In Progress window 50 or to close out the Critical Emergency window 56. The Remove button will only remove one of the alarms listed, and only if the alarm is not a critical alarm. User selects the alarm to be removed (using mouse-click, etc.) and then presses Remove button. Otherwise, alarms remain on the list until the conditions which triggered them cease. Alarms can be forced off the list by going to the individual room screen and altering the vital sign limits, signs monitored, or patient status.

It is important to note that certain colors are used to reinforce the information involved. Most of the sites are in a normal condition. They are in a green color (colors not shown in the Figures). The warning sites (Rooms 228 and 208) are shown in a yellow color and the critical site, Room 221, is shown in a red color. In addition, the title bar 57 of the Critical Emergency window 56 has a red background. The title bar 58 of the In Progress window 50 has a red background when there is a critical item in that window, a yellow background when there are only warning items in that window and a green background when the window is empty. In addition, the red room icon 52 will be a flashing red in order to attract attention. However, the yellow room icons 53, 54 will not be flashing. In addition, the color purple is used to indicate a disconnect of the vital sign sensor. This purple color off-line warning is in response to a null signal from the medical monitor. A null signal from the monitor will cause the central server 16 to generate a disconnect signal which can provide a unique audio alarm 22 and a unique (purple) color designation for the title bars 57 in the pop-up window 56 and on the relevant room icon. The background of the title bar 61 on the FIG. 5 zoom-in display will also be purple.

If there is more than one alarm condition requiring a pop-up window 56, multiple windows 56 will be shown, overlaid and offset to provide the observer with an indication that there is a plurality of windows 56 and to permit access to each window by whatever accessing technique is employed such as the mouse click.

FIG. 4 indicates the screen display that could be called up for a particular room. This zoom-in screen display can be called up through a keyboard input of the room number or by an appropriate touch on the overview screen. FIG. 4 shows the non-alarm display for Room 221, corresponding to the FIG. 2 normal display condition. FIG. 5 shows the zoom-in display for the critical condition in Room 221, which critical condition is flagged by the FIG. 3 display. In FIG. 5, the BP (blood pressure) symbol 60 at the upper left is red and flashing indicating a critical condition. Each of the six vital signs is indicated in both analog and digital form. The patient is identified and the primary ailment is indicated.

In the normal FIG. 4 condition, the title bar 61 has a green background color and the icons indicating the various vital signs are green providing the vital signs are within the normal range. This use of green for normal condition helps to make sure that the yellow and red for lesser and greater level of emergency conditions stand out when they do occur. In FIG. 5, not only is the BP icon 60 red and flashing but the left column 62 representing diastolic pressure in analog form is also red and flashing. The rest of the vital sign icons and analog bar graphs are a normal green color representing a non-emergency condition.

This display arrangement shown in FIGS. 2 through 5 provides a useful trade-off of selection and focus in real time against a more comprehensive data presented in a less focused fashion and/or not being in real time.

Thus the overview screen of FIGS. 2 and 3 provides a real time indication that there is an emergency, where it is occurring, how severe the emergency is (that is, whether it is at a warning level or a critical level) and which type of vital sign function is out of line. The

overview screen also provides a geographic presentation of where the emergency is.

The zoom-in screen (single site screen) of FIGS. 4 and 5 also provides all information in real time. However, it displays all of the functions and not only the function that is out of normal range. Furthermore, the zoom-in screen displays data in both digital form and analog form.

Furthermore, all program screens display information in both digital and analog form, showing both a numeric and abstract representation. This provides an intuitive grasp of the information presented, eliminating the time lag, confusion, and user error associated with information which must be skillfully interpreted.

By limiting the vital signs monitored to six, it becomes possible and feasible to monitor a large number of sites. Thus the system is particularly adapted to the general hospital situation more than to the intensive care unit situation (ICU). In an ICU situation, very specific and individual monitoring of many other parameters and conditions may be involved. But the cost and complexity of doing such makes the ICU type of situation inappropriate and in fact not used in the general hospital situation. More particularly, it is also the depth of information gathered from each sign that increases the data required dramatically, not just the number of signs monitored. The transmission and analysis of wave forms is what requires hundreds of times more processing power. However, it is useful only for a select few patients who are deemed critical enough to be placed in the high-cost ICU monitoring area. The six vital signs themselves are meaningful enough for most patients, and the number of patients who require this level of monitoring is a significant percentage of those occupying hospital rooms, a number many times greater than even the largest ICU's can handle.

The operational features which are critical to why this system is an improvement over anything presently known and in particular why it provides a meaningful monitoring of a large number of patients include the following:

1. The selection of a limited number of vital signs (six in particular).

2. The provision of a two stage alarm system based on a vital sign having passed a threshold wherein two separate thresholds are used to distinguish between a warning alarm and a critical alarm.

3. The display of a set of vital sign warning indicators in conjunction with the geographic display indicating where each patient is on a floor.

4. The ability to zoom-in on a patient site to obtain a display of more detailed information on the patient for whom there is either a warning condition or a critical condition.

5. The ability to grade the alarm importance as a partial function of patient's status.

In addition, because of the structure of the system, in which an intelligent central server is used in conjunction with a large number of dumb monitors, each one of which is in direct communication with the central server, the whole system becomes not only a good deal less expensive than other types of monitoring systems, but a good deal more fault tolerant and more flexible. Specifically, a broken lead or missing sensor will not adversely affect the operation of the rest of the system and a monitor can be moved around from site to site or patient to patient without requiring a reconfiguring of the system.

The combination of the above features, makes it economically feasible to provide significantly greater monitoring for individuals who are not appropriate for an intensive care unit and to provide such for as large a number of patients as is desired. It is feasible to achieve this extensive result because a reasonable amount of computer capacity and equipment is required. Thus extending significant and meaningful monitoring beyond those who are in an intensive care unit becomes economically feasible.

In addition the iconography of the display provides a particularly useful presentation of information to those who must monitor the situation leading to a more immediate recognition of where a warning situation exists, what the nature of it is likely to be and what individuals are involved.

The various pop-up windows of FIGS. 7 and 8 are provided to permit user modification of various parameters and selection of various options for a particular patient at a particular site.

FIGS. 4 and 5 show a series of seven "buttons" along the bottom of the screen. These buttons, which can be either click-on mouse cursor buttons or touch screen buttons, are actuated to call up the desired one of the windows shown in FIG. 6 or FIG. 7. The LIMITS button **64** will cause the "Set Vital Sign Limits" window **65** to appear. There is a normal default set of vital sign limits for adults. Actuating the adult button **66** and reset button **67** will cause that default set to appear. There is also a normal default child set of signs and a normal default senior set of signs and actuating the appropriate buttons **68** or **69** will cause those to appear. However, the individual user can tailor one or more of the vital sign limits by the usual use of a curser to locate the position on the screen where that limit is to appear and then keying in the desired limit. When the user has established the vital sign limits desired, actuating the "OK" button **70** will cause the screen to revert to the FIG. 4 zoom in state for that patient.

The "Set Vital Sign Limits" window **65** is important to enable the user to tailor the warning range and critical range of any one or more vital signs to what would be appropriate for a particular patient.

The other FIG. 6 windows are self-explanatory except the Patient Status window **70**. The Patient Status window permits selecting the level of monitoring that is geared to the patient's condition. This is most important as it provides an important function in determining the Notification State discussed below.

The trends window of FIG. 7 is a pop-up window that can be accessed by actuating the trends button **80** in the lower left half corner of the screen as shown in FIG. 5. The particular vital sign that will be shown as a time line on the trends window for the particular patient can be selected by clicking on to the desired vital signs shown on the left portion of this window. In one embodiment, the default trend line is the one for the last twenty-four hours. However, the user can extend that time period by entering an appropriate starting date and ending date.

The selection of patient status in window **70** will partially determine how a particular out-of-limits or off-line condition is to be treated. A number of Notification States from most to least serious is provided. These Notification States can be grouped from most serious to a no—problem state as follows:

| NOTIFICATION STATE | PATIENT STATUS | VITAL SIGN CONDITION | ALARM SIGNALS PROVIDED |
|---|---|---|---|
| 1 | 2 Or 3 | Exceeds Critical Limits | Flashing Red & Siren |
| 2 | 3 | Off-Line | Flashing Purple & Siren |
| 3 | 2 or 3 | Exceeds Warning Limits | Solid Yellow & Siren |
| 4 | 1 | Exeeds Critical Limits | Solid Red |
| 5 | 1 | Exceeds Warning Limits | Solid Yellow |
| 6 | 2 | Off-Line | Flashing Purple |
| 7 | 1, 2, 3 | All Within Normal Limits | Solid Green |
| 8 | 1 | Off-Line | Solid Purple |
| 9 | 1, 2 or 3 | Sign Not Being Monitored | Solid Purple |

Notification States 1 through 8 ar only for those vital signs being monitored. If a vital sign is not selected on the window **72**, then that sign will appear solid purple (Notification State 9) and the other Notification States will be provided in response to only those signs being monitored.

## Appendix

The programming made possible by using commercially available program packages means that the following instructions would be adequate to permit one skilled in this art to create the system of this invention as described herein.

### Instructions To Programmers

I. Guidelines:
  A. Create program screens with associated animation, icons, buttons, windows, and logic as described in the section Characteristics and Logic for Program Screens, and pictured in the sections Full-screen Views, and Pop-up Window Views.
  B. Connect all objects to the data they describe.
  C. Set default values for room parameters. note: both default values, and all room parameter values, will be kept in only one place, e.g. on the central server. Values can be changed from any workstation on the network.
  D. Add data storage logic for data and alarms:
    1. Signs database shall contain patient name, room number (221*a* for first bed in room 221, 221*b* for second bed, etc), date, time, and all sign values.
    2. Signs will be stored to disk every fifteen minutes.
    3. Alarms (Notification States 1-3) database shall contain room number, nature of alarm (warning, critical, off-line), date, time, and all sign values.
    4. Alarms will be stored in the alarms database as they occur.
  E. Add Security-Logic:
    Levels of security clearance are as follows:
    1. View all screens, silence alarms.
    2. Above, plus use of buttons on Individual Bed Screen, close alarms, and remove alarms ( from-in-progress list).
    3. Above, plus set overall parameter defaults.
II. Characteristics and Logic for Program Screens
  A. Overview Screen:
    1. Bed I cons
      Displays one icon for each bed monitored, icons being positioned on screen according to floor plan, including hallways, etc., to create a facility map (can be for entire building, or just one floor).
        If a room has only one bed, the bed icon will show up on the map as being the size and shape of the room which contains it.
        In the event that more than one bed is located in a room, the bed icons will be placed together to form the shape of the room which contains them.
      Selecting a bed icon brings up its individual Bed screen (see next section).
      Color/animation conventions:
        Bed icons shall obey color/animation conventions listed in individual Bed screen section.
        Animation and color of bed icon shall match the Notification State of the most critical vital sign icon for that particular bed.
        Lower numbers represent more critical Notification States.
    2. Alarms:
      Notification States 1, 2 and 3 will be considered alarms. Alarms shall sound audio signal, display pop-up alarm window, and appear in the Alarms-in progress window.
      Alarms will also activate the following dial-out options, if the options are selected: **1**) Deliver alarms to central station, 2) Deliver alarms to pager.
      Audio signals for critical, warning, and off-line will have different volume levels and different sound patterns.
    3. Pop-up alarm window shall include:
      Title bar displaying the nature of alarm i.e., Critical, warning, or off-line.
      Color of title bar shall match the conventions for the Notification State of the alarm it describes.
      Room number.
      Date and time.
      Description of problem (e.g., Diastolic pressure=260).
      Silence alarm button turns off audio alarm signal
      Close alarm button turns off audio alarm signal, and closes pop-up alarm window, but room remains in animation until alarm conditions cease (can be forced by changing limits in patient's individual bed screen).
    4. Alarms-in-progress window (left side of screen)
      Color of title bar shall match the conventions for the Notification State of the most critical alarm listed.
      Lists alarms in progress, by category ( critical, then off-line, then warning), and within each category, by time of occurrence ( oldest to newest).
      Each list entry will show room number, nature (critical, etc.), sign, and time of occurrence.
      Window also has remove button which allows user to delete entries from list.
      Individual entries can be deleted only if they are warning or off-line alarms; entries describing critical alarms will remain until alarm conditions cease (can be forced by changing limits).
  B. Individual Bed Screens
    1. Vital Sign Icons:

One icon for each sign monitored, positioned in a horizontal row at the top of the screen.

Icons shall obey the following color conventions.

2. Color conventions:

Notification State 9: Steady purple if sign is selected not to be monitored.

Notification State 8: Steady purple if sign is off-line (patient status level 1).

Notification State 7: Steady green if sign is within normal limits.

Notification State 6: Flashing purple if sign is off-line (patient status level 2).

Notification State 5: Steady yellow if sign exceeds warning limits (patient status level 1).

Notification State 4: Steady red if sign exceeds critical limits (patient status level 1).

Notification State 3: Steady yellow if sign exceeds warning limits (patient status levels 2, 3).

Notification State 2: Flashing purple if sign is off-line (patient status level 3).

Notification State 1: Flashing red if sign exceeds critical limits (patient status levels 2, 3).

3. Faceplates:

One faceplate for each sign monitored, positioned under the associated icon.

Display the numerical value of monitored sign at bottom of faceplate.

Display a vertical bar graph representation of monitored sign above numerical value.

Bar graph shall include an axis labeled with appropriate units.

Bar graph shall follow color conventions.

4. ID Window:

Title bar shall include room number, date, and time.

Title bar background shall follow color conventions (background shall change animation state to match the most critical icon animation state, see color conventions above).

Window shall display patient name and primary ailment (interface with external database).

Buttons:

Buttons in horizontal row at bottom of screen.

Exit button closes window and returns to overview screen.

Trends button:

Allows user to view historical trends of monitored vital signs.

Displays pop-up window displaying starting date, and finish date for trend graph.

Also shows list of vital signs with radio buttons to choose which sign will be graphed.

Includes Cancel and Graph buttons.

6. **Limits button:**

Allows user to set both upper and lower warning and critical limits for any or all signs.

Displays pop-up window listing each sign, its upper and lower warning limits, and its upper and lower critical limits.

Pop-up window includes buttons for OK, cancel, reset (to default limits), and radio button for child/adult/senior.

7. Signs button:

Allows user to choose which signs are monitored (e.g. patient may only need to have BP and pulse monitored).

Displays a pop-up window showing the list of vital signs, with OK and cancel buttons.

Includes a check box for each sign, and one for all signs (checking this turns all signs on).

8. Status button:

Allows user to determine how Notification States are handled.

Displays pop-up window with OK and cancel buttons.

Radio buttons let user select one of three status levels

level 1: patient receiving sporadic monitoring (patient has signs checked by hooking up to a monitor from time to time, e.g. an outpatient).

level 2: patient receiving semi-continuous monitoring (patient may disconnect from time to time, may be ambulatory, e.g. someone in for overnight observation).

level 3: patient receiving continuous monitoring (patient must always be connected to monitor, is not ambulatory).

9. Dial-out button:

Determines how application will notify parties of signs and alarms for particular bed.

Displays pop-up window including OK and cancel buttons.

Also shows checklist for the following three dial-out options, with a separate phone number displayed next to each option.

Deliver signs to central station—if checked, application will dial associated number periodically to deliver sign values to another Solowatch system.

Deliver alarms to central station—if checked, application will dial associated number and deliver all alarms to another Solowatch workstation. For Notification States 1, 2 and 3 only.

Deliver alarms to pager—if checked, application will dial associated number and deliver alpha-numeric alarm message to pager (same message as shown in Alarms-in-progress window). For Notification States 1, 2 and 3 only.

Phone numbers can be edited at any time.

10. Reset button:

Resets all bed parameters to default values.

Displays pop-up window cautioning user that all signs will be reset to defaults.

Affects patient status, signs selected, warning and critical limits, patient age, and communications options.

Also displays buttons for OK and Cancel.

For security purposes, defaults (which are determined by the user) can be changed only by altering application.

Typical defaults might be as follows:

Patient status=level 1.

Signs selected=all.

Patient age=adult.

Communications=no dial-outs.

Warning and critical limits=as determined by user.

What I claimed is:

1. A medical monitoring system comprising:

a plurality of individual site vital sign monitors, each of said monitors providing a plurality of vital sign signals for each of said plurality of sites,

a central processing unit, said vital sign signals from each of said site monitors being coupled as inputs to said central processing unit;

a display screen coupled to outputs from said central processing unit;

an overview display on said screen, said display including a topological presentation of each of said sites and a first set of icons, each icon of said first set representing a separate one of said sites,

a plurality of vital sign states for each of said vital signs at each of said individual sites, each of said vital sign states providing an indication of the relative significance of the vital signal being measured by a monitor relative to a predetermined vital sign value limit,

means to set a patient status state at each of said sites,

a set of Notification States to rank the relative importance of the vital state occurring at each of said individual sites as a partial function of said patient status state and a partial function of said vital sign state, and

a set of alarm signals indicating said Notification States, said alarm signal employing said first set of said icons to provide site identification of the Notification State involved.

2. The medical monitoring system of claim 1 wherein said plurality of vital sign states includes:

a critical state indicating that a vital sign value is outside of a second set of predetermined value limits, said second set of value limits being narrower than said first set of value limits, and

an off line state indicating that a vital sign monitor is not providing a signal.

3. The medical monitoring system of claim 1 wherein said set of Notification States includes:

first subsets of said Notification States indicated by alarm signals which include (i) site specific ones of said first set of icons to identify the site involved, (ii) an auditory alarm and (iii) a site-specific pop-up window on said overview display, said pop-up window including identification of the vital sign which is the basis of the Notification State involved,

second subsets of said Notification States indicated by alarm signals which include site specific ones of said first set of icons flashing on said screen to identify the site involved,

third subsets of said Notification States indicated by alarm signals which include site specific ones of said first set of icons providing a color change on said screen to identify the site involved.

4. The medical monitoring system of claim 2 wherein said set of Notification States includes:

first subsets of said Notification States indicated by alarm signals which include an auditory alarm and a site-specific pop-up window on said screen, said pop-up window including identification of the vital sign which is the basis of the Notification State involved,

second subsets of said Notification States indicated by alarm signals which include site specific ones of said first set of icons flashing on said screen,

third subsets of said Notification States indicated by alarm signals which include site specific ones of said first set of icons providing a color change on said screen.

5. The medical monitoring system of claim 2 further comprising:

a second set of icons providing an indication of said vital sign status, said second set of icons including an indication of the ones of said vital sign states that are represented by the Notification State involved,

a third set of icons providing an indication of patient vital sign values, and

an operator actuated zoom-in presentation on said display screen for a particular site on said overview display, said zoom-in presentation including icons from said second and third sets of icons.

6. The medical monitoring system of claim 4 further comprising:

a second set of icons providing an indication that a vital sign is outside of said predetermined value limits, said second set of icons including an indication of the one of said vital sign states of whatever vital sign is outside of said predetermined value limits,

a third set of said icons providing indication of patient vital sign values, and

an operator actuated zoom-in presentation on said display screen for a particular site on said overview display, said zoom-in presentation including icons from said second and third sets of icons.

7. The medical monitoring system of claim 2 further comprising:

a normal vital sign state to indicate a vital sign within limits condition wherein the vital sign value is within said second set of predetermined value limits.

8. The medical monitoring system of claim 4 further comprising:

a normal vital sign state to indicate a vital sign within limits condition wherein the vital sign value is within said second set of predetermined value limits.

9. The medical monitoring system of claim 5 further comprising:

a normal vital sign state to indicate a vital sign within limits condition wherein the vital sign value is within said second set of predetermined value limits.

10. The medical monitoring system of claim 6 further comprising:

a normal vital sign state to indicate a vital sign within limits condition wherein the vital sign value is within said second set of predetermined value limits.

11. The medical monitoring system of claim 3 further comprising:

an alarms-in-progress window on said screen listing predetermined ones of said Notification States at each of said sites.

12. The medical monitoring system of claim 4 further comprising:

an alarms-in-progress window on said screen listing predetermined ones of said Notification States at each of said sites.

13. The medical monitoring system of claim 6 further comprising:

an alarms-in-progress window on said screen listing predetermined ones of said Notification States at each of said sites.

14. The medical monitoring system of claim 8 further comprising:
an alarms-in-progress window on said screen listing predetermined ones of said Notification States at each of said sites.

15. The medical monitoring system of claim 10 further comprising:
an alarms-in-progress window on said screen listing predetermined ones of said Notification States at each of said sites.

16. The method of medically monitoring a plurality of patients at a plurality of sites comprising the steps of:
on a display screen, providing a topological presentation of each of said sites,
employing a first set of icons, each of said icons representing a separate one of said sites, on said topological presentation,
at each of said sites, substantially continuously measuring a plurality of predetermined vital sign values to provide a set of vital sign signals for each of said sites,
simultaneously comparing each of said vital sign values to predetermined value limits to provide a plurality of vital signal states at each of said sites indicating relative significance of any out of normal vital sign values,
providing a patient status state at each of said sites,
providing a set of Notification States to rank the relative importance of the vital sign state occurring at each of said individual sites as a partial function of said patient status state and a partial function of said vital sign state,
providing a set of alarm signals to indicate said Notification States,
employing said first set of icons as part of said set of alarm signals to provide site identification of the Notification State involved.

17. The method of claim 16 wherein said step of providing a set of Notification States includes the steps of:
providing a first subset of said alarm signals to indicate a first subset of said Notification States including changing a characteristic of site specific ones of said first set of icons to identify the site involved, providing an auditory alarm and providing a site specific pop-up window on said overview display, said pop-up window including identification of the vital sign which is the basis of the Notification State involved,
providing a second subset alarm signals to indicate a second subset of said Notification States including a flashing presentation of site specific ones of said first set of icons to identify the site involved,
providing a third subset of said alarm signal to indicate a third subset of said Notification States including changing the color of site specific ones of said first set of icons to identify the site involved.

18. The method of claim 17 comprising the further steps of:
within said plurality of vital sign states, providing (i) a critical state indicating that a vital sign is outside of a first set of predetermined value limits, (ii) a warning state indicating that a vital sign is outside of a second set of predetermined value limits, said second set of value limits being narrower than said first set of value limits, and (iii) providing an off-line state indicating that a vital sign monitor is not providing a signal,
providing a second set of icons to indicate the ones of said vital sign states that are represented by one of said Notification States,
providing a third set of icons to indicate the patient vital sign values represented by the Notification State involved, and
providing a zoom-in presentation on a display screen for a particular site on said overview display and employing said first and second set of icons in said zoom-in presentation.

* * * * *

**EXHIBIT E**

US006633900B1

# (12) United States Patent
Khalessi et al.

(10) Patent No.: **US 6,633,900 B1**
(45) Date of Patent: **Oct. 14, 2003**

(54) **MOBILE CREW MANAGEMENT SYSTEM FOR DISTRIBUTING WORK ORDER ASSIGNMENTS TO MOBILE FIELD CREW UNITS**


(75) Inventors: **Amir Khalessi**, Cary, NC (US); **Sasan H. Ardalan**, Cary, NC (US)

(73) Assignee: **ABB Inc.**, Raleigh, NC (US)



(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/509,100**

(22) PCT Filed: **Jan. 8, 1999**

(86) PCT No.: **PCT/US99/00497**

§ 371 (c)(1), (2), (4) Date: **Apr. 26, 2000**

(87) PCT Pub. No.: **WO99/35549**

PCT Pub. Date: **Jul. 15, 1999**

(51) **Int. Cl.**[7] ....................... **G06F 15/16**; G06F 15/173; H04H 1/00; H04B 7/24

(52) **U.S. Cl.** ....................... **709/202**; 709/201; 709/223; 709/224; 455/3.01; 455/39

(58) **Field of Search** ................................ 709/202, 223, 709/201, 224; 455/3.01, 39



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| 6,047,327 A | * | 4/2000 | Tso et al. | 709/232 |
| 6,535,493 B1 | * | 3/2003 | Lee et al. | 370/329 |

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*Primary Examiner*—Krisna Lim
(74) *Attorney, Agent, or Firm*—Woodcock Washburn LLP

(57) **ABSTRACT**


A system for multi-crew management comprises an enterprise computing system, a mobile field unit, and wireless communication network which supports terminal control protocol/internet protocol (TCP/IP). The enterprise computing network comprises application programs through which work orders may be assigned and managed, various server machines containing data related to the work orders, a local area network (LAN) connecting the server machines, and a gateway to the TCP/IP wireless network. A mobile field unit comprises a computing device and modem for communicating over the wireless network to the enterprise computing system. A mobile field unit and each machine in the enterprise computing system has a unique IP address assigned to it. Accordingly, commands and data can be communicated freely between all machines.


**27 Claims, 18 Drawing Sheets**

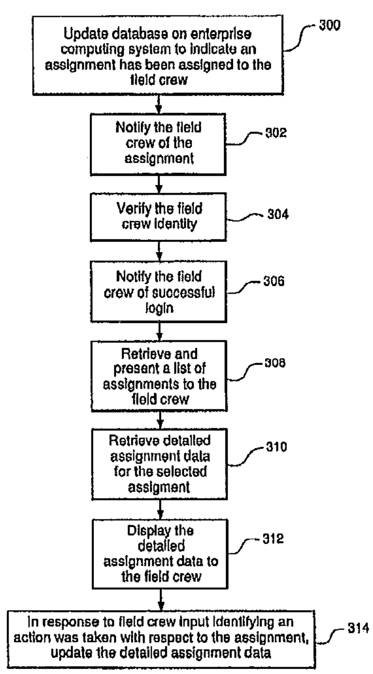



**EXHIBIT E**

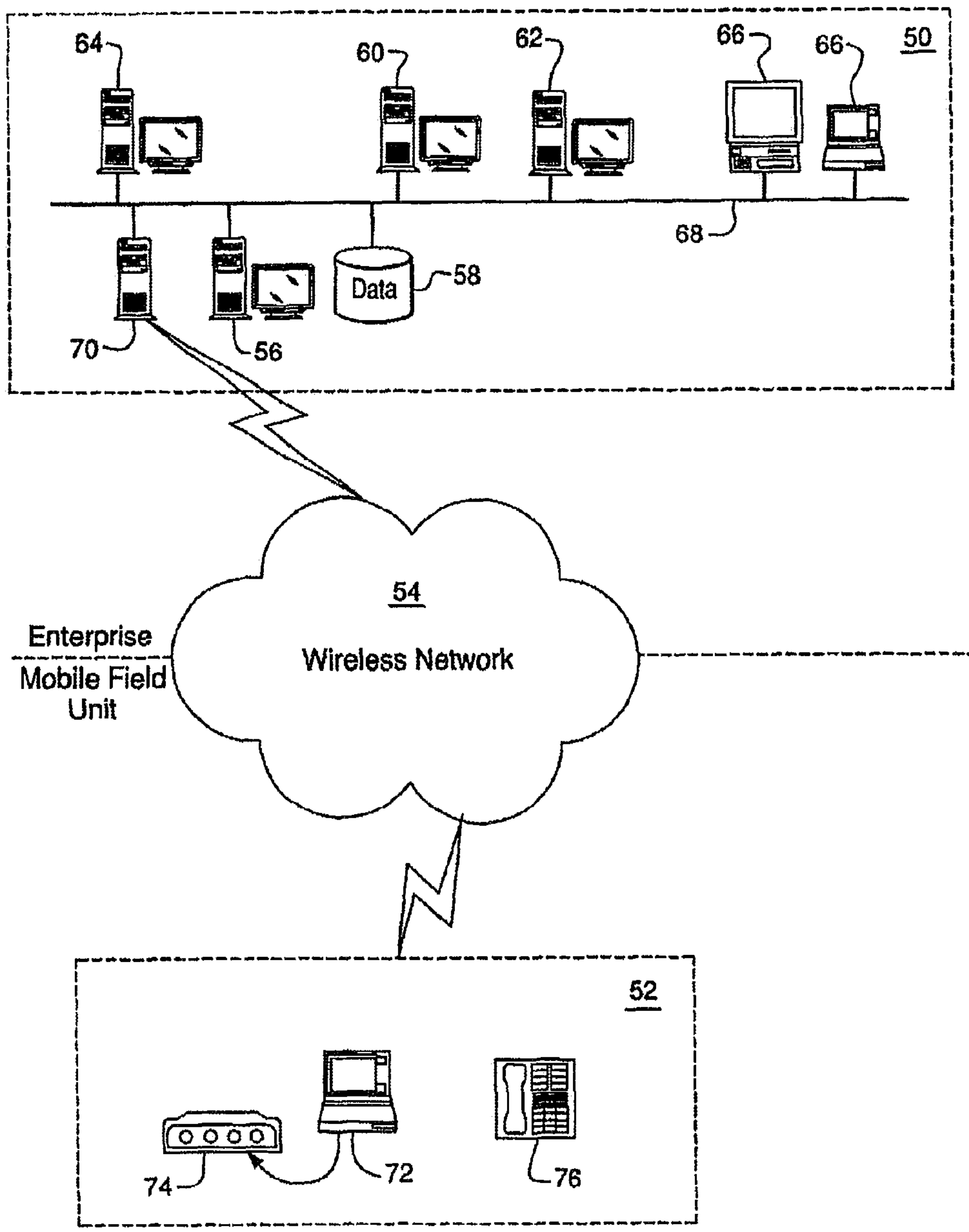

64
60
62
66
66
50
68
Data
58
70
56
54
Wireless Network
Enterprise
Mobile Field
Unit
52
74
72
76

FIG. 1

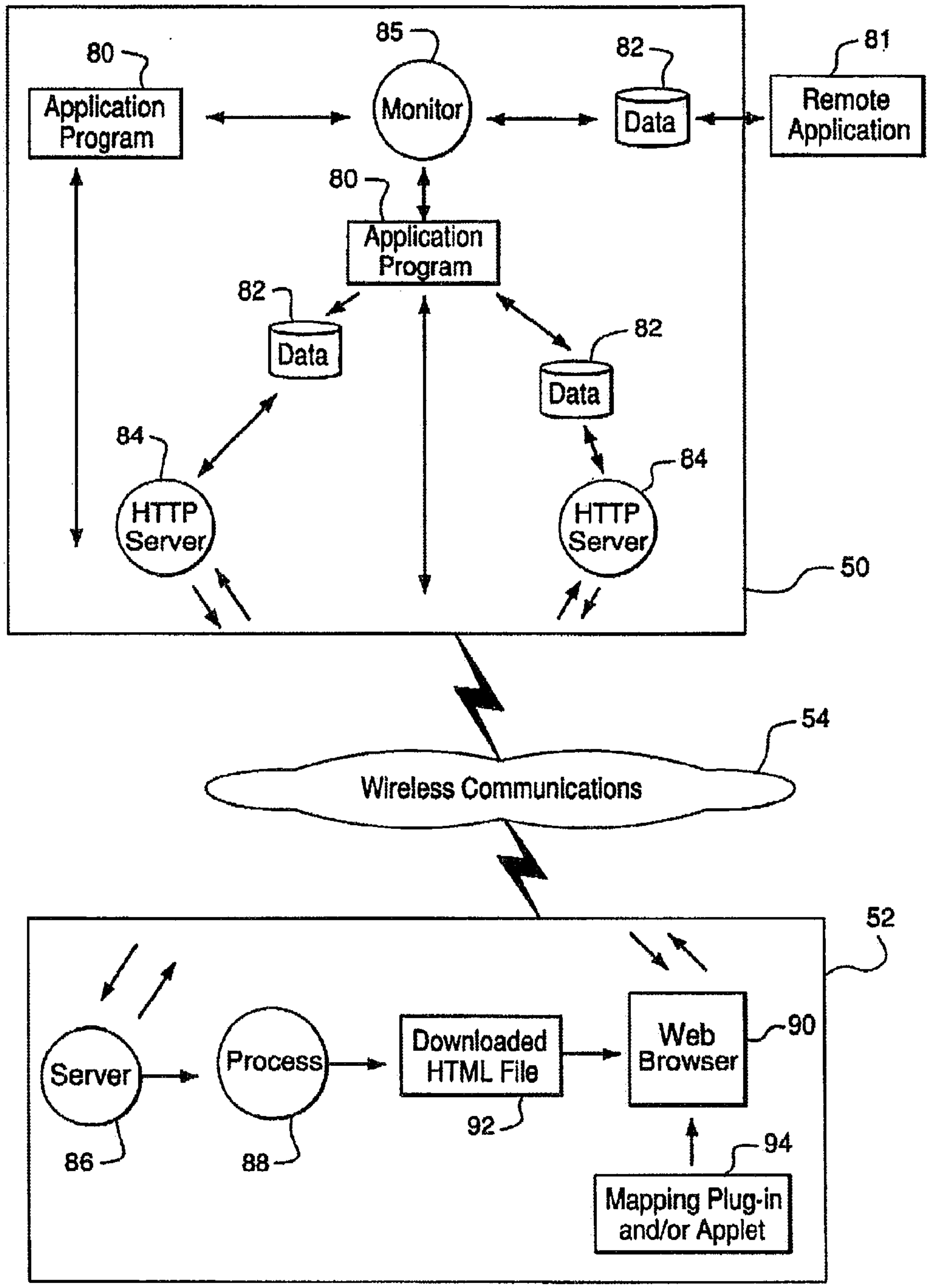

80
Application Program
85
Monitor
82
Data
81
Remote Application
80
Application Program
82
Data
82
Data
84
HTTP Server
84
HTTP Server
50
54
Wireless Communications
52
Server
86
Process
88
Downloaded HTML File
92
Web Browser
90
94
Mapping Plug-in and/or Applet

FIG. 2

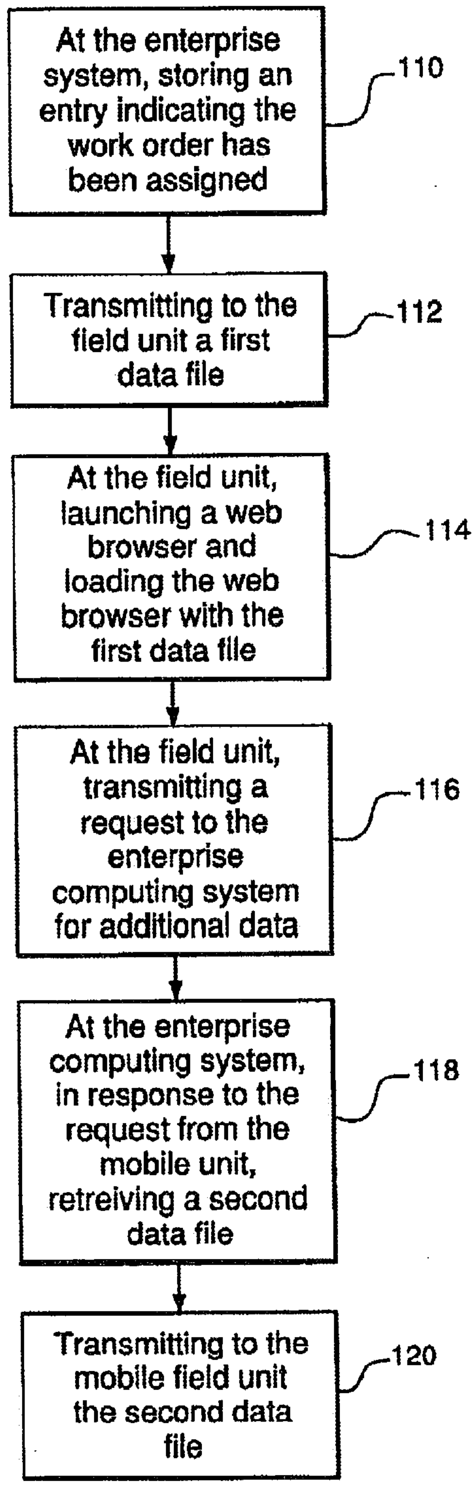
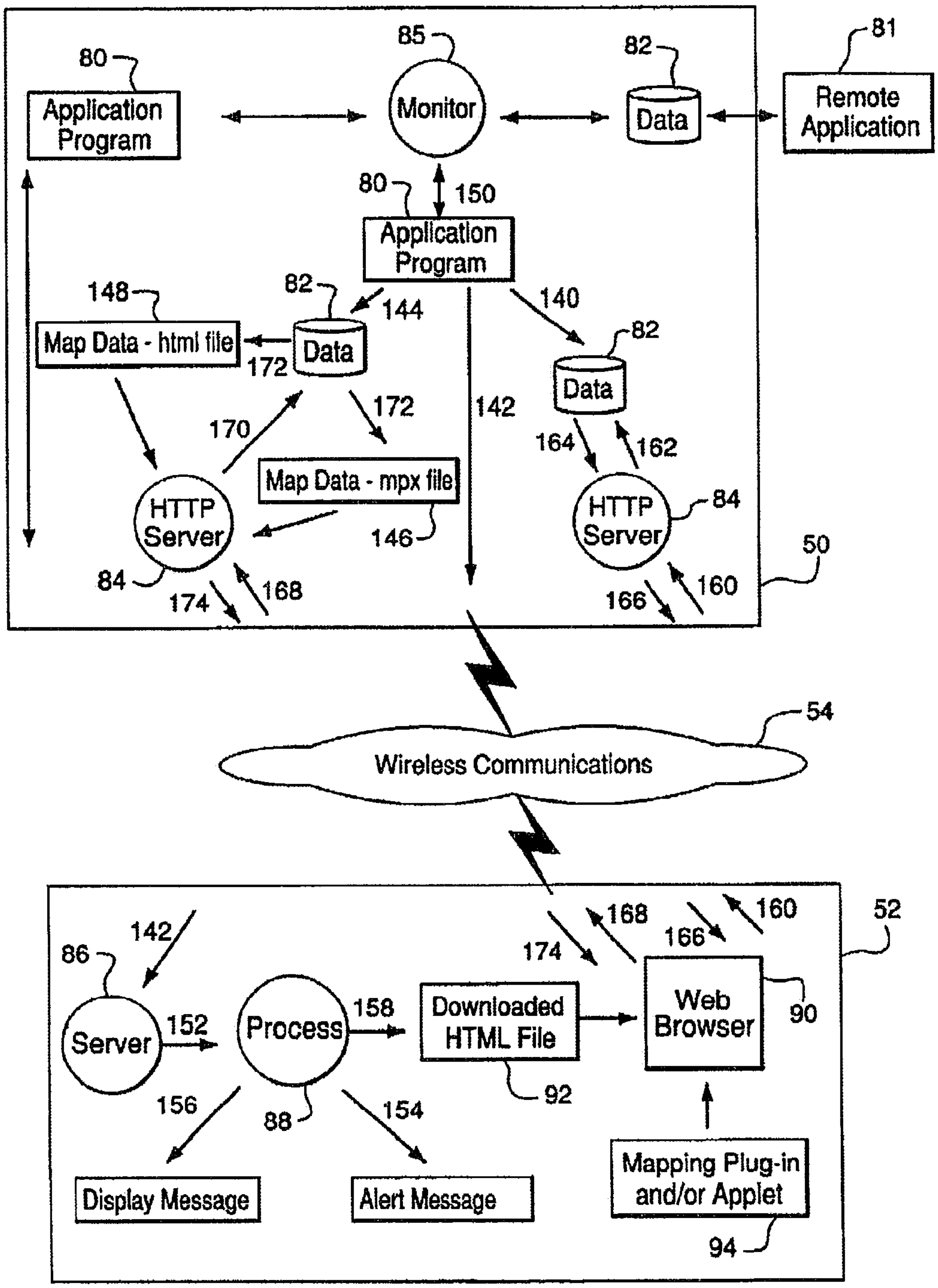

At the enterprise system, storing an entry indicating the work order has been assigned
110
Transmitting to the field unit a first data file
112
At the field unit, launching a web browser and loading the web browser with the first data file
114
At the field unit, transmitting a request to the enterprise computing system for additional data
116
At the enterprise computing system, in response to the request from the mobile unit, retreiving a second data file
118
Transmitting to the mobile field unit the second data file
120

FIG. 3



85
Monitor
82
Data
81
Remote Application
80
Application Program
80
150
Application Program
148
Map Data - html file
82
Data
144
140
82
Data
172
172
142
170
Map Data - mpx file
164
162
HTTP Server
HTTP Server
84
146
50
84
174
168
166
160
Wireless Communications
54
168
160
166
174
52
86
142
Server
152
Process
158
Downloaded HTML File
Web Browser
90
156
88
154
92
Display Message
Alert Message
Mapping Plug-in and/or Applet
94


FIG. 4

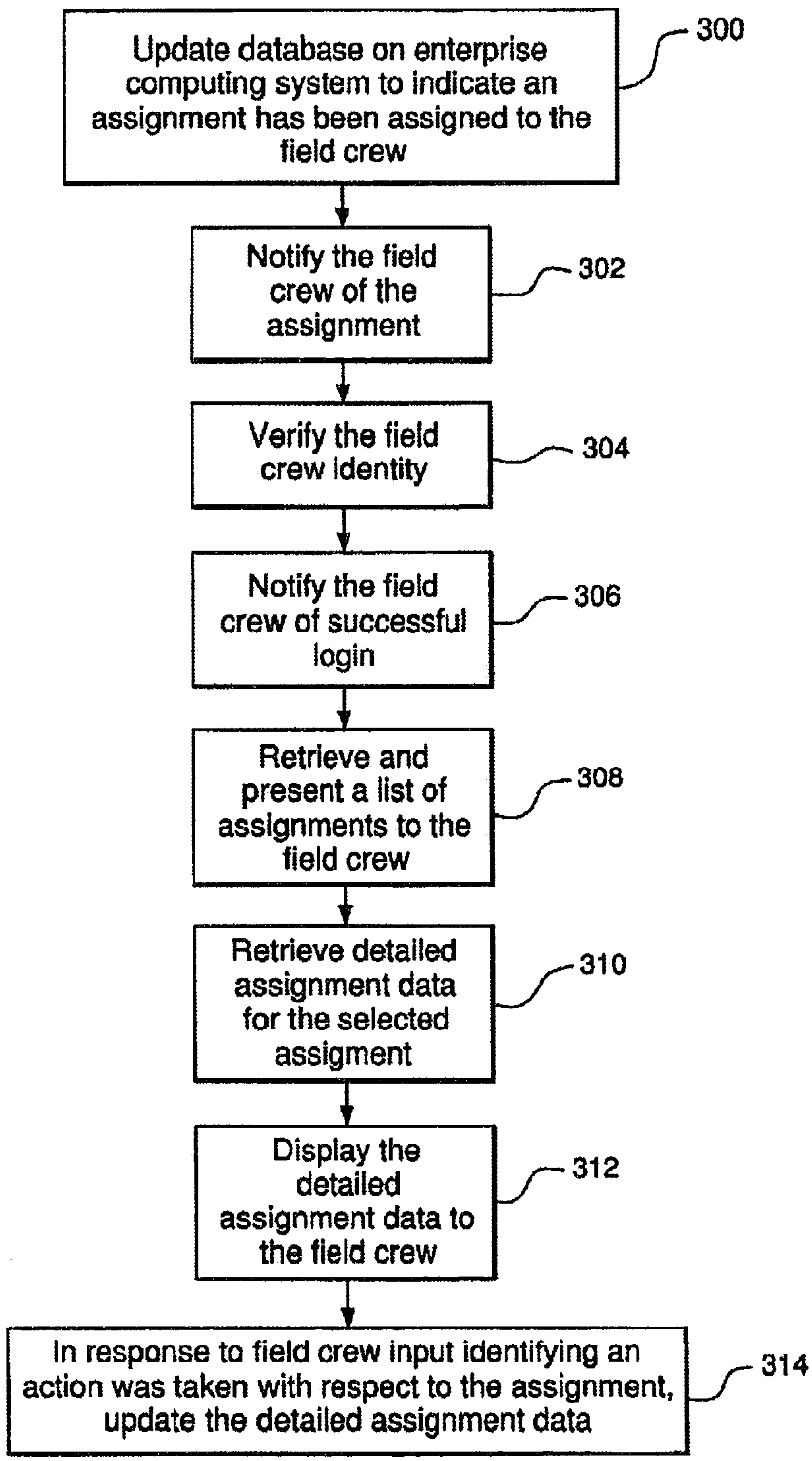

Update database on enterprise computing system to indicate an assignment has been assigned to the field crew
300
Notify the field crew of the assignment
302
Verify the field crew identity
304
Notify the field crew of successful login
306
Retrieve and present a list of assignments to the field crew
308
Retrieve detailed assignment data for the selected assigment
310
Display the detailed assignment data to the field crew
312
In response to field crew input identifying an action was taken with respect to the assignment, update the detailed assignment data
314

FIG. 5

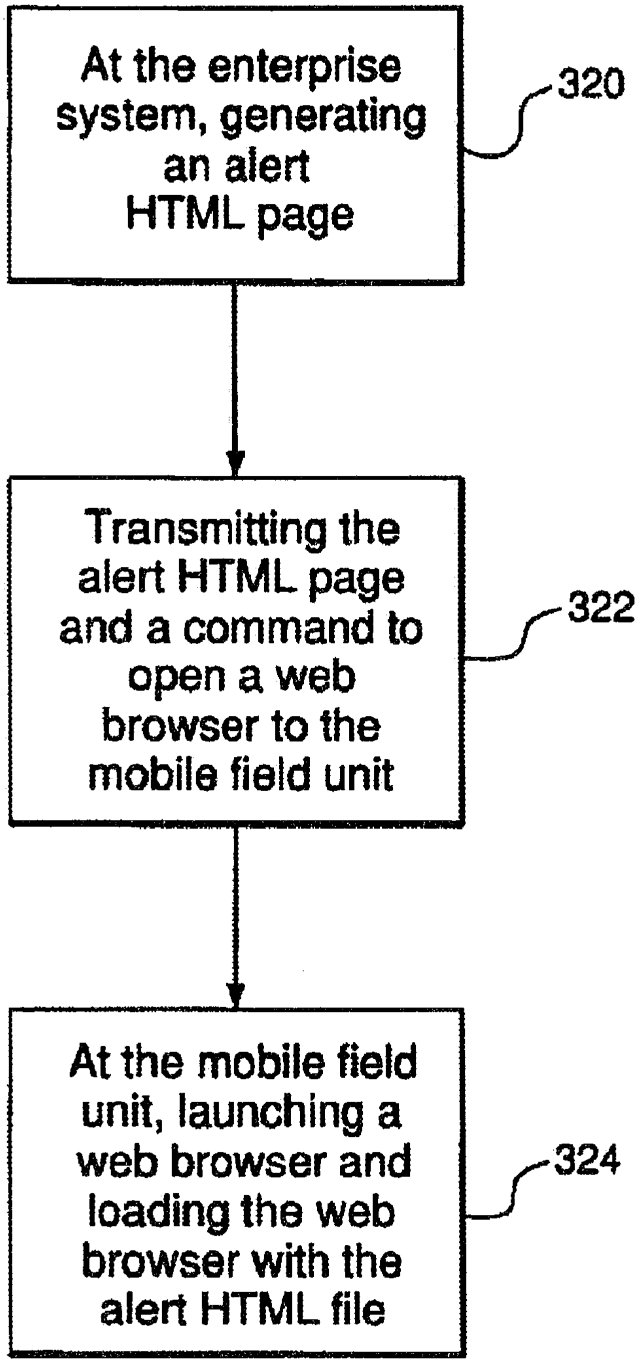

At the enterprise system, generating an alert HTML page
320
Transmitting the alert HTML page and a command to open a web browser to the mobile field unit
322
At the mobile field unit, launching a web browser and loading the web browser with the alert HTML file
324

FIG. 6

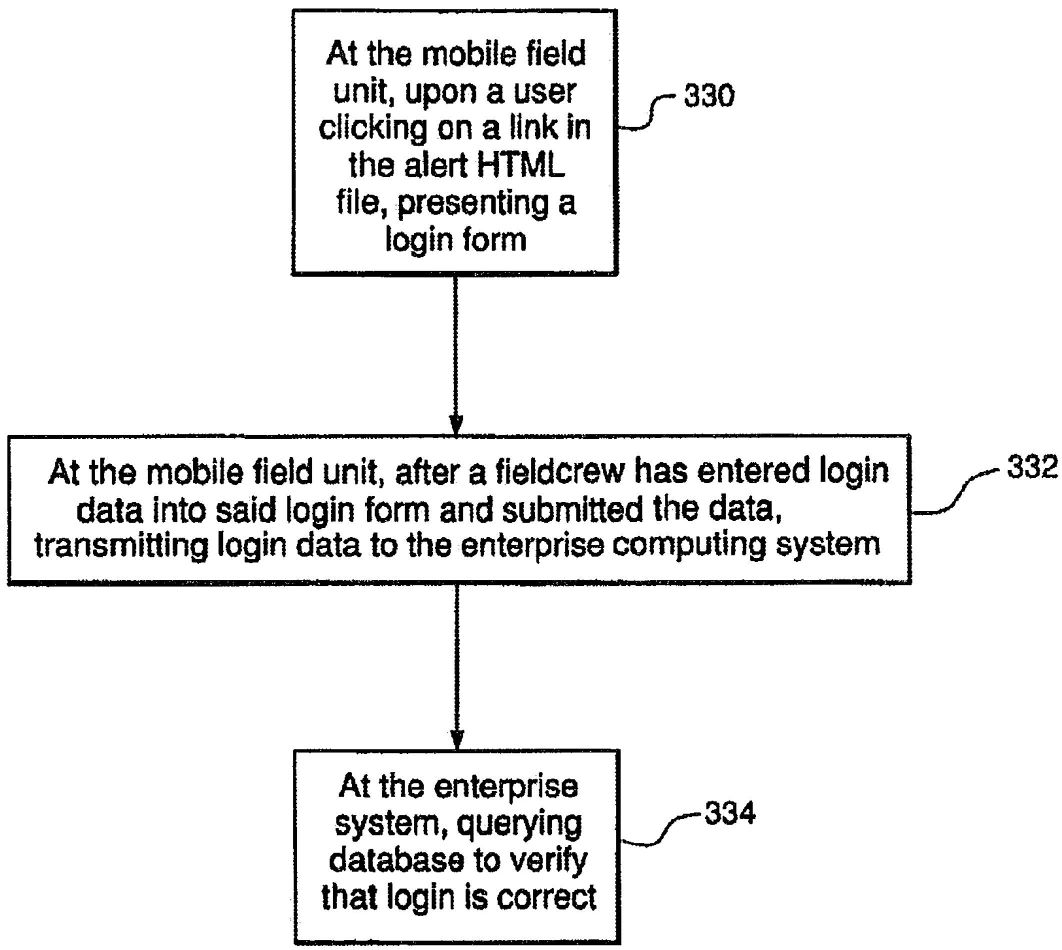

At the mobile field unit, upon a user clicking on a link in the alert HTML file, presenting a login form
330
At the mobile field unit, after a fieldcrew has entered login data into said login form and submitted the data, transmitting login data to the enterprise computing system
332
At the enterprise system, querying database to verify that login is correct
334

FIG. 7

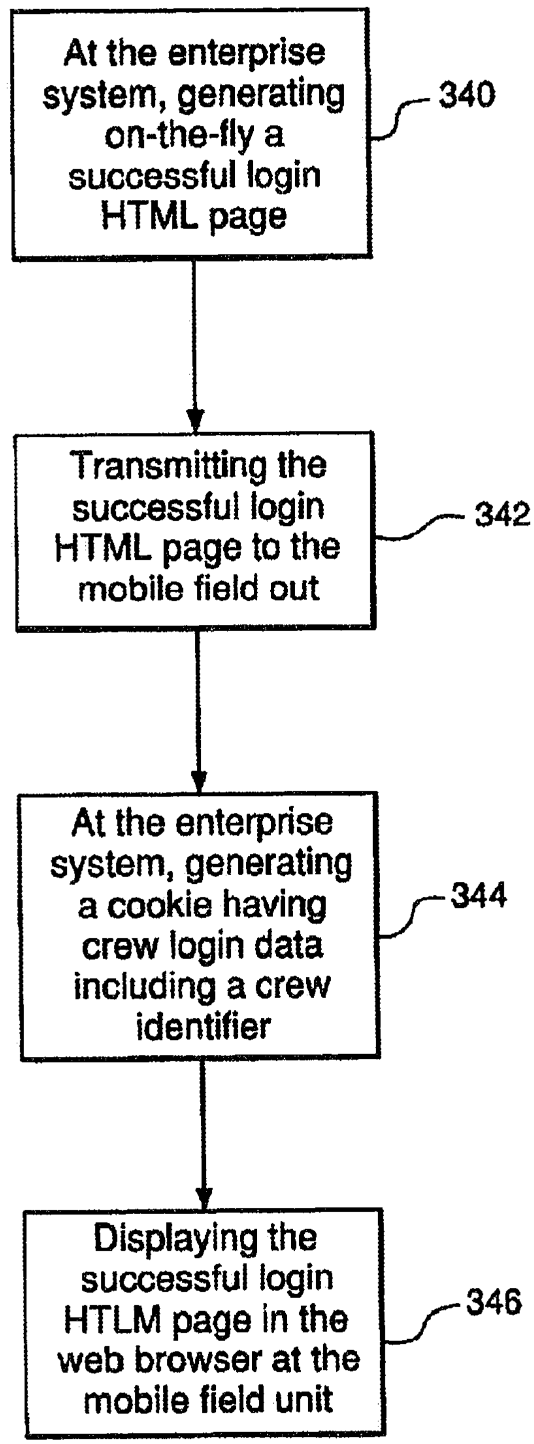

At the enterprise system, generating on-the-fly a successful login HTML page
340
Transmitting the successful login HTML page to the mobile field out
342
At the enterprise system, generating a cookie having crew login data including a crew identifier
344
Displaying the successful login HTLM page in the web browser at the mobile field unit
346

FIG. 8

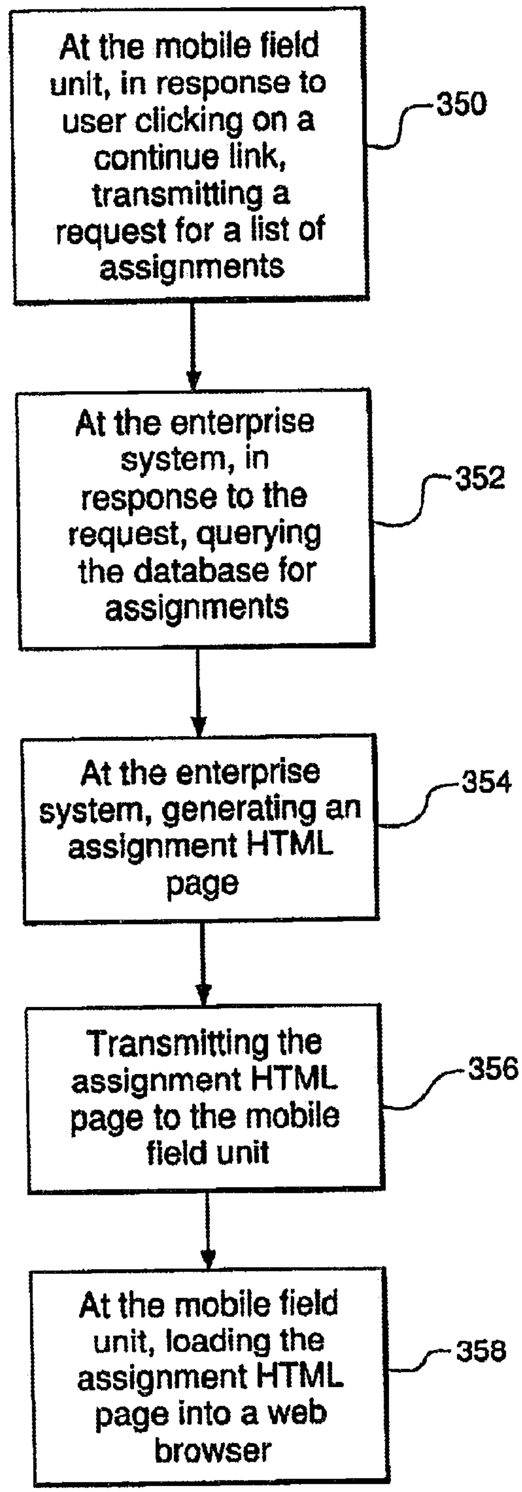

At the mobile field unit, in response to user clicking on a continue link, transmitting a request for a list of assignments
350
At the enterprise system, in response to the request, querying the database for assignments
352
At the enterprise system, generating an assignment HTML page
354
Transmitting the assignment HTML page to the mobile field unit
356
At the mobile field unit, loading the assignment HTML page into a web browser
358

FIG. 9

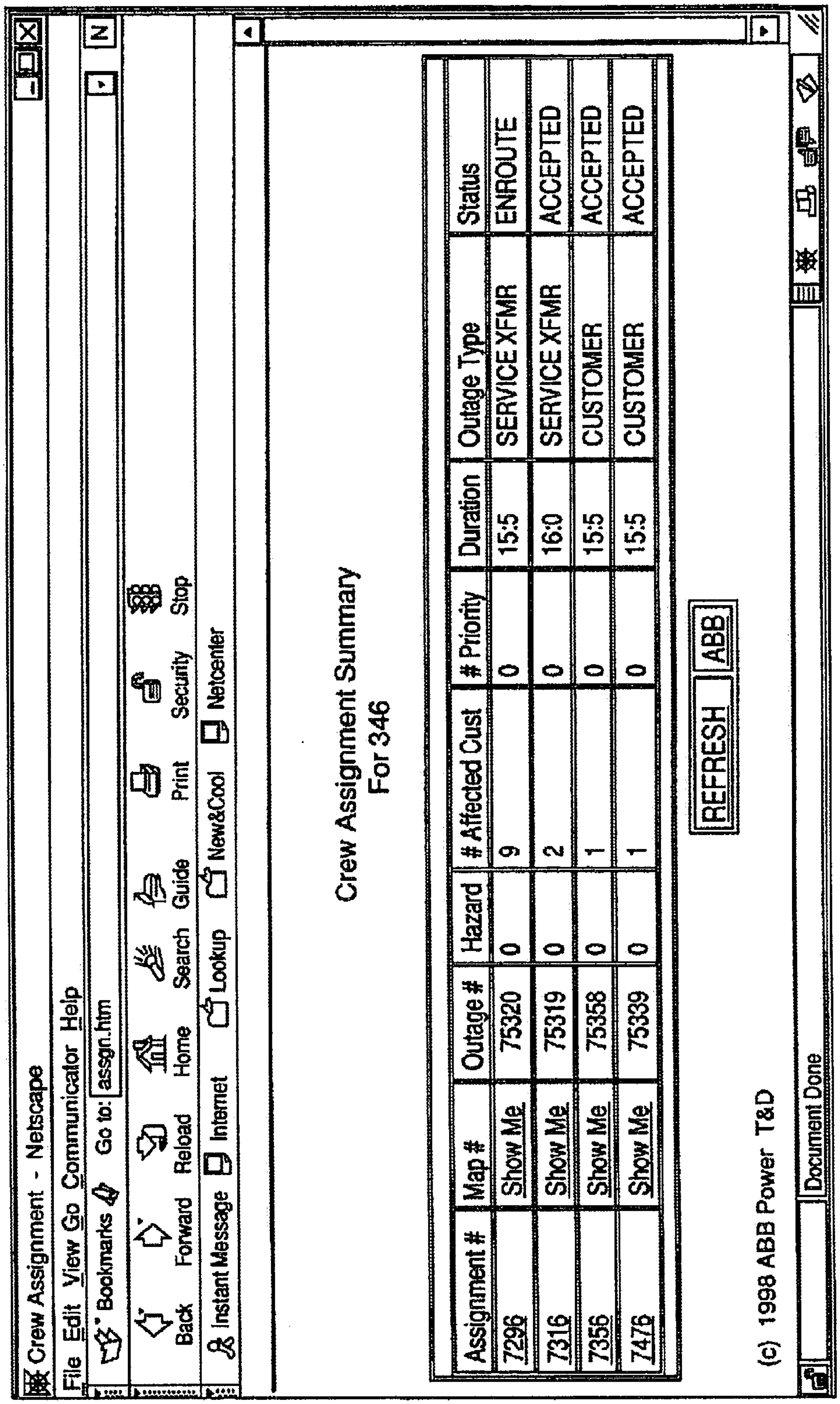

Crew Assignment - Netscape
File Edit View Go Communicator Help
Bookmarks Go to: assgn.htm
Back Forward Reload Home Search Guide Print Security Stop
Instant Message Internet Lookup New&Cool Netcenter
Crew Assignment Summary
For 346
Assignment # | Map # | Outage # | Hazard | # Affected Cust | # Priority | Duration | Outage Type | Status
7296 | Show Me | 75320 | 0 | 9 | 0 | 15:5 | SERVICE XFMR | ENROUTE
7316 | Show Me | 75319 | 0 | 2 | 0 | 16:0 | SERVICE XFMR | ACCEPTED
7356 | Show Me | 75358 | 0 | 1 | 0 | 15:5 | CUSTOMER | ACCEPTED
7476 | Show Me | 75339 | 0 | 1 | 0 | 15:5 | CUSTOMER | ACCEPTED
REFRESH
ABB
(c) 1998 ABB Power T&D
Document Done

FIG. 10

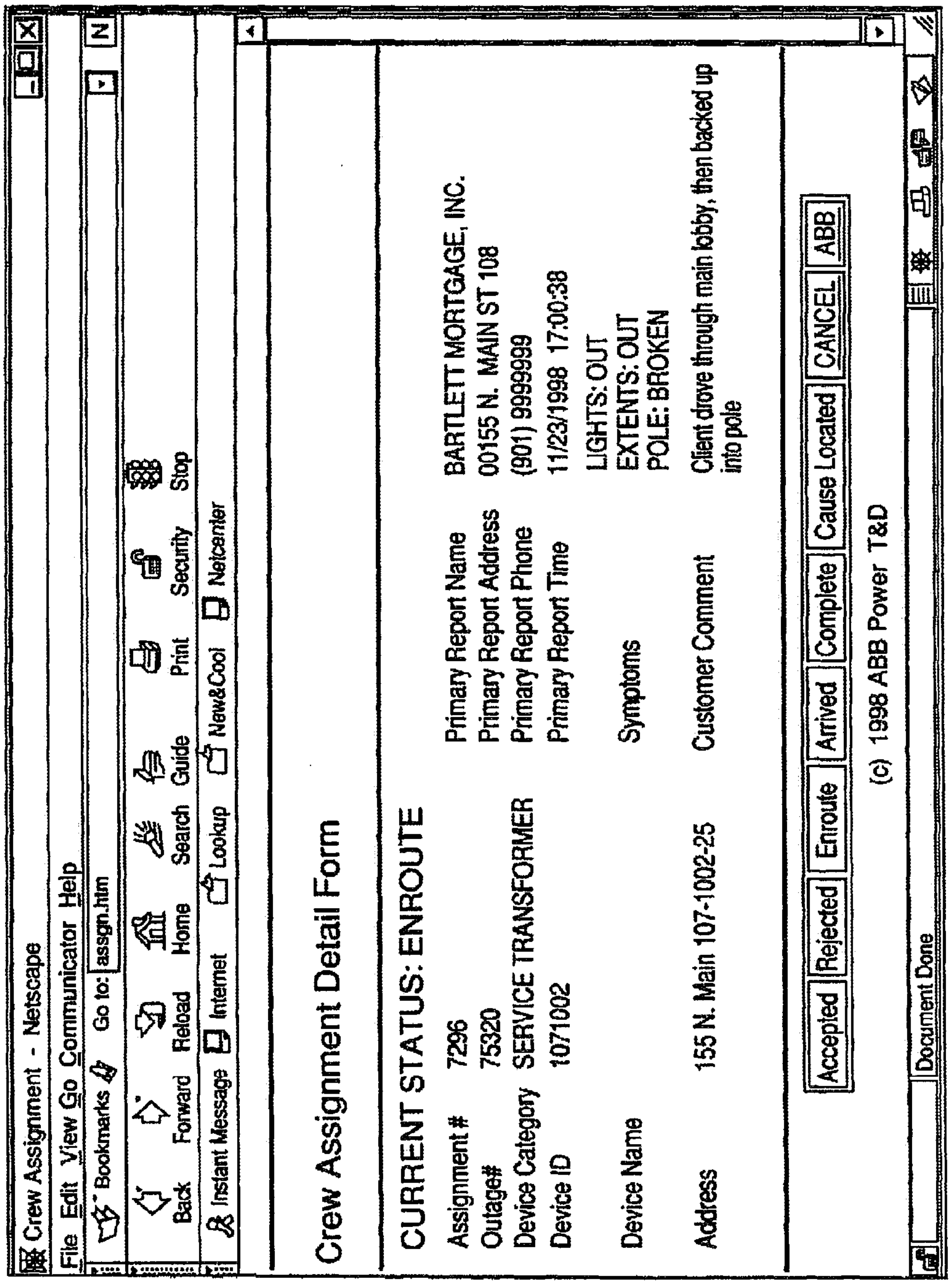

Crew Assignment - Netscape
File Edit View Go Communicator Help
Bookmarks Go to: assgn.htm
Back Forward Reload Home Search Guide Print Security Stop
Instant Message Internet Lookup New&Cool Netcenter
Crew Assignment Detail Form
CURRENT STATUS: ENROUTE
Assignment # 7296
Outage# 75320
Device Category SERVICE TRANSFORMER
Device ID 1071002
Device Name
Address 155 N. Main 107-1002-25
Primary Report Name BARTLETT MORTGAGE, INC.
Primary Report Address 00155 N. MAIN ST 108
Primary Report Phone (901) 9999999
Primary Report Time 11/23/1998 17:00:38
Symptoms LIGHTS: OUT
EXTENTS: OUT
POLE: BROKEN
Customer Comment Client drove through main lobby, then backed up into pole
Accepted
Rejected
Enroute
Arrived
Complete
Cause Located
CANCEL
ABB
(c) 1998 ABB Power T&D
Document Done

FIG. 11

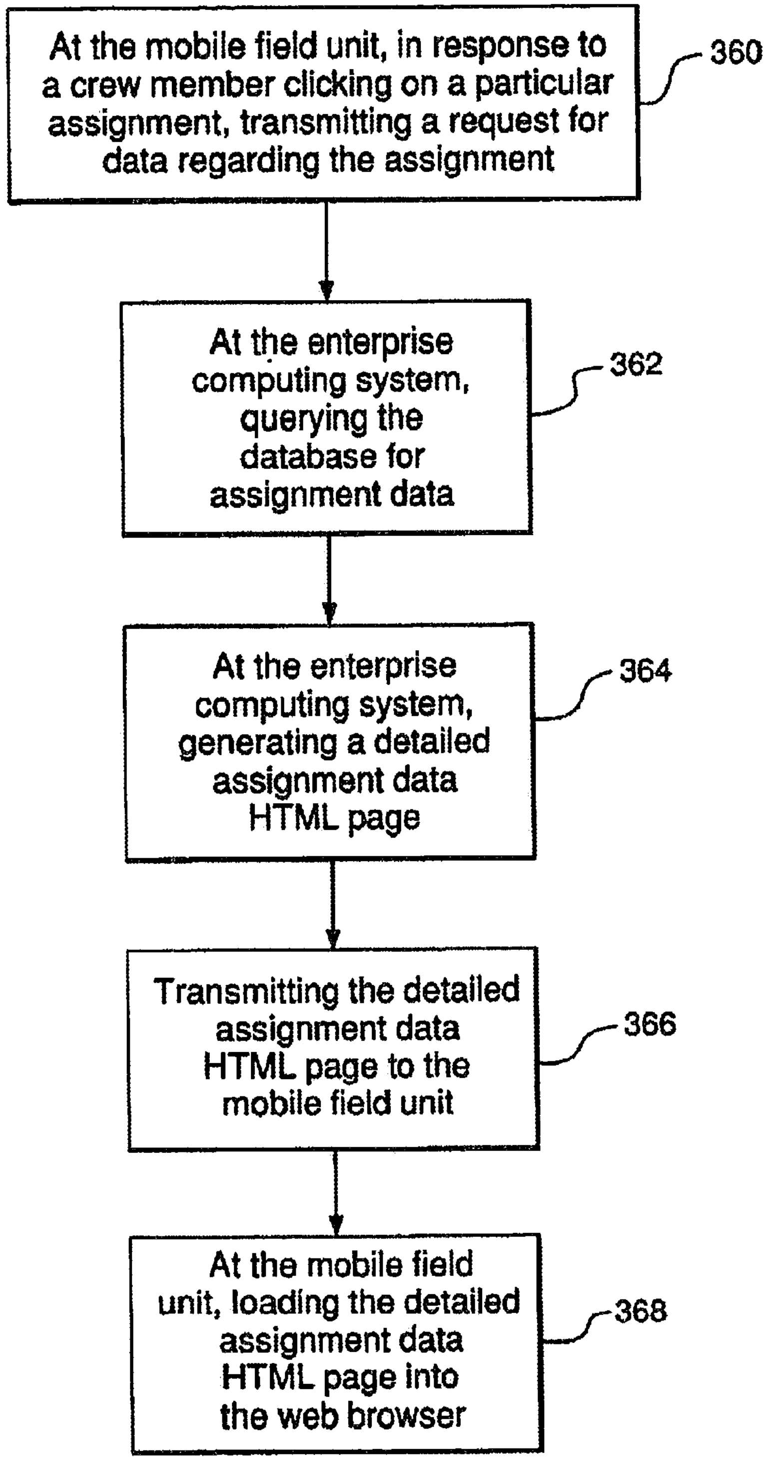
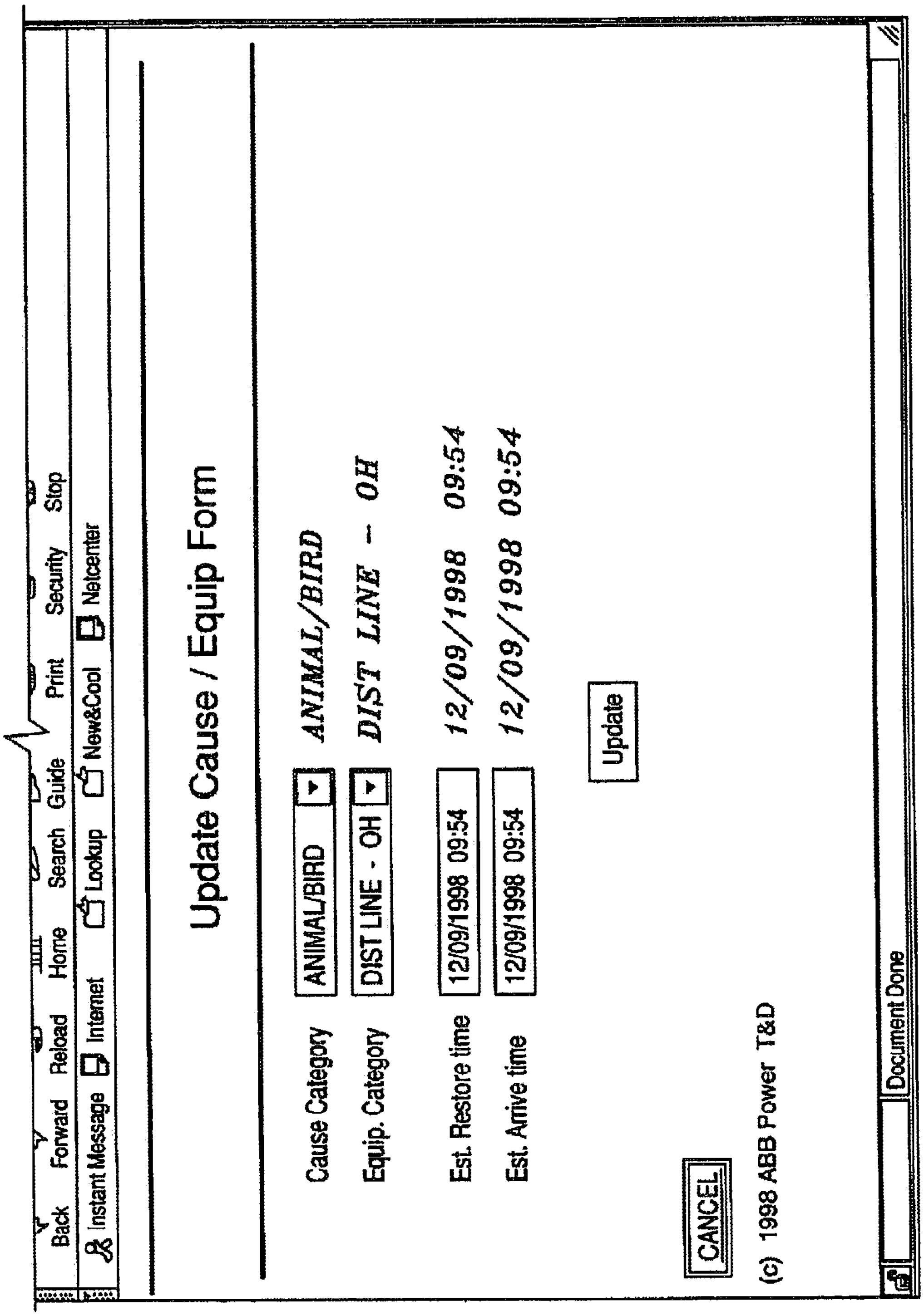

At the mobile field unit, in response to a crew member clicking on a particular assignment, transmitting a request for data regarding the assignment
360
At the enterprise computing system, querying the database for assignment data
362
At the enterprise computing system, generating a detailed assignment data HTML page
364
Transmitting the detailed assignment data HTML page to the mobile field unit
366
At the mobile field unit, loading the detailed assignment data HTML page into the web browser
368

FIG. 12

FIG. 13



Back
Forward
Reload
Home
Search
Guide
Print
Security
Stop
Instant Message
Internet
Lookup
New&Cool
Netcenter
Update Cause / Equip Form
Cause Category
ANIMAL/BIRD
ANIMAL/BIRD
Equip. Category
DIST LINE - OH
DIST LINE -- OH
Est. Restore time
12/09/1998 09:54
12/09/1998 09:54
Est. Arrive time
12/09/1998 09:54
12/09/1998 09:54
Update
CANCEL
(c) 1998 ABB Power T&D
Document Done

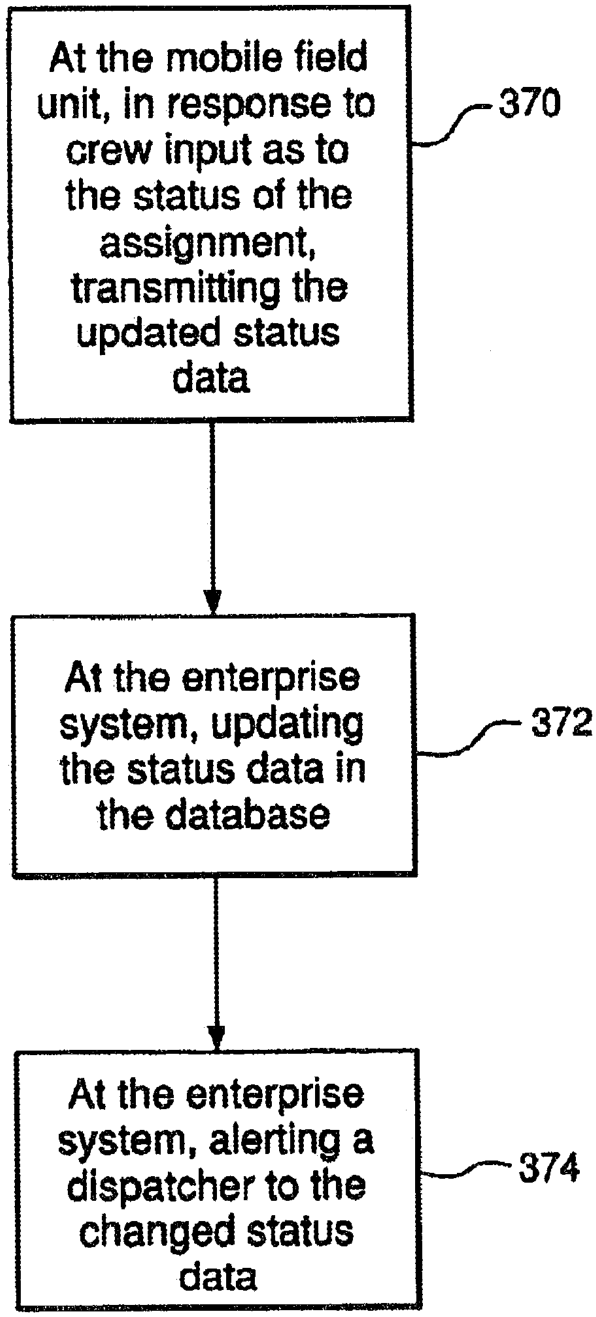

At the mobile field unit, in response to crew input as to the status of the assignment, transmitting the updated status data
370
At the enterprise system, updating the status data in the database
372
At the enterprise system, alerting a dispatcher to the changed status data
374

FIG. 14

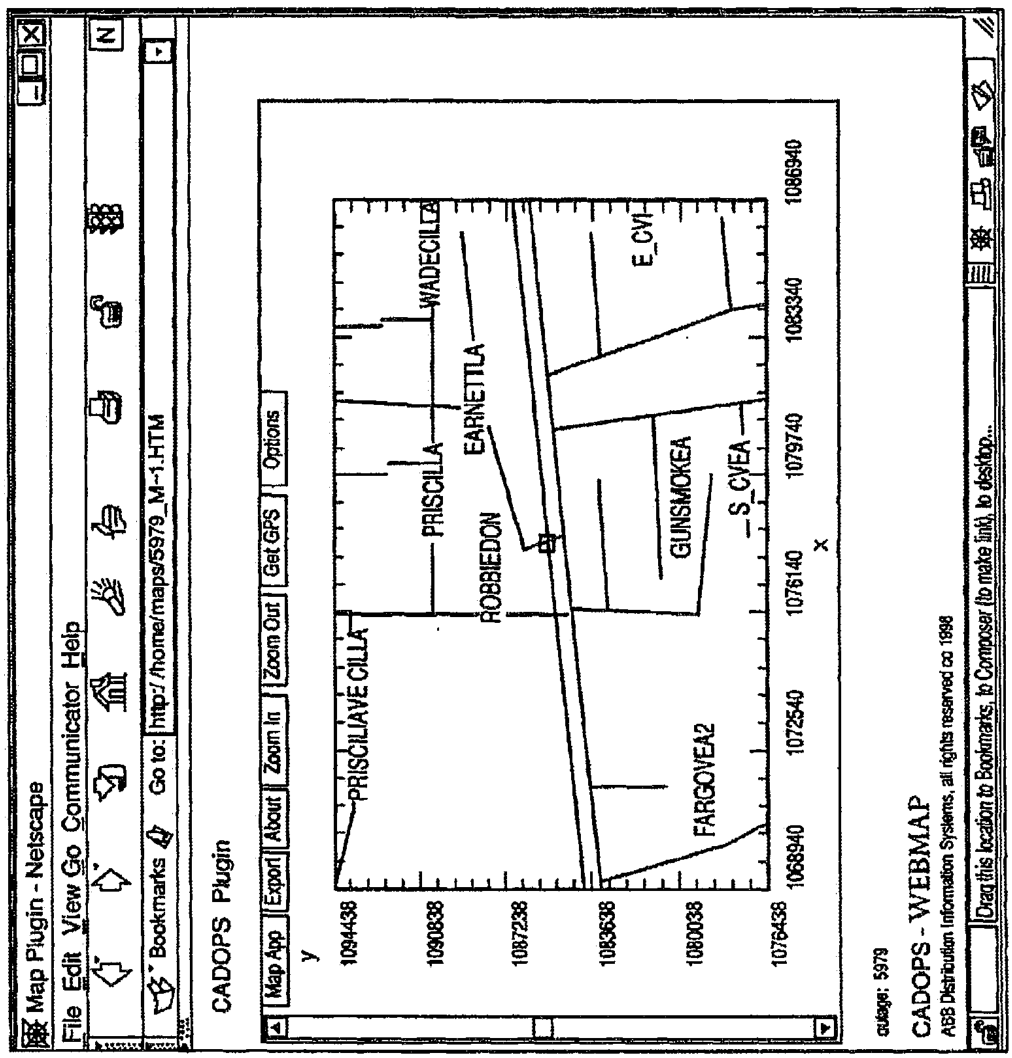

Map Plugin - Netscape
File Edit View Go Communicator Help
Bookmarks Go to: http://home/maps/5979_M~1.HTM
CADOPS Plugin
Map App
Export
About
Zoom In
Zoom Out
Get GPS
Options
y
1094438
1090838
1087238
1083638
1080038
1076438
1068940
1072540
1076140
1079740
1083340
1086940
x
PRISCILIAVE CILLA
PRISCILA
WADECILLA
EARNETTLA
ROBBIEDON
GUNSMOKEA
S_CVEA
E_CVI
FARGOVEA2
outage: 5979
CADOPS - WEBMAP
ABB Distribution Information Systems, all rights reserved cc 1998
Drag this location to Bookmarks, to Composer (to make link), to desktop...

FIG. 15

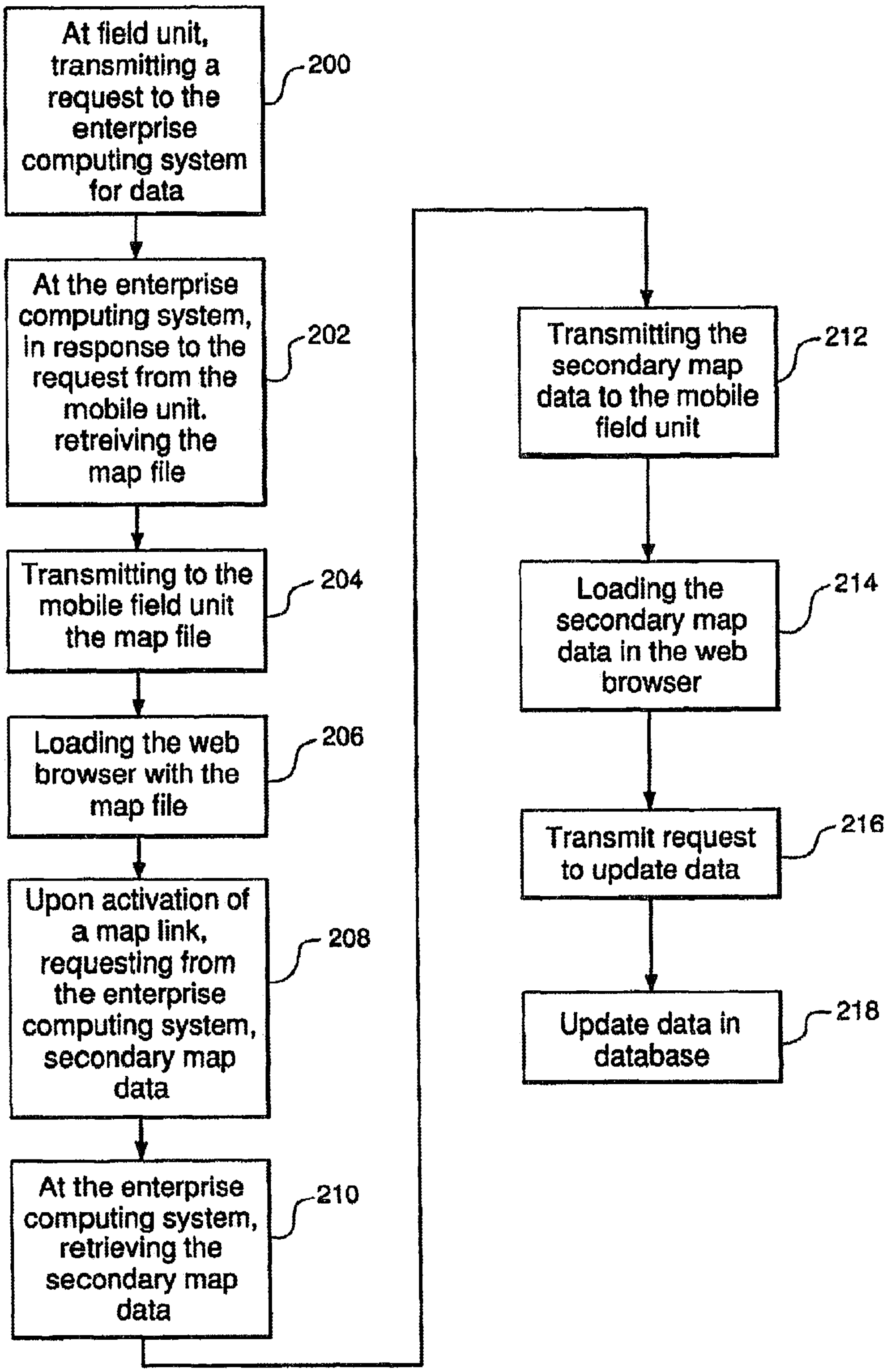
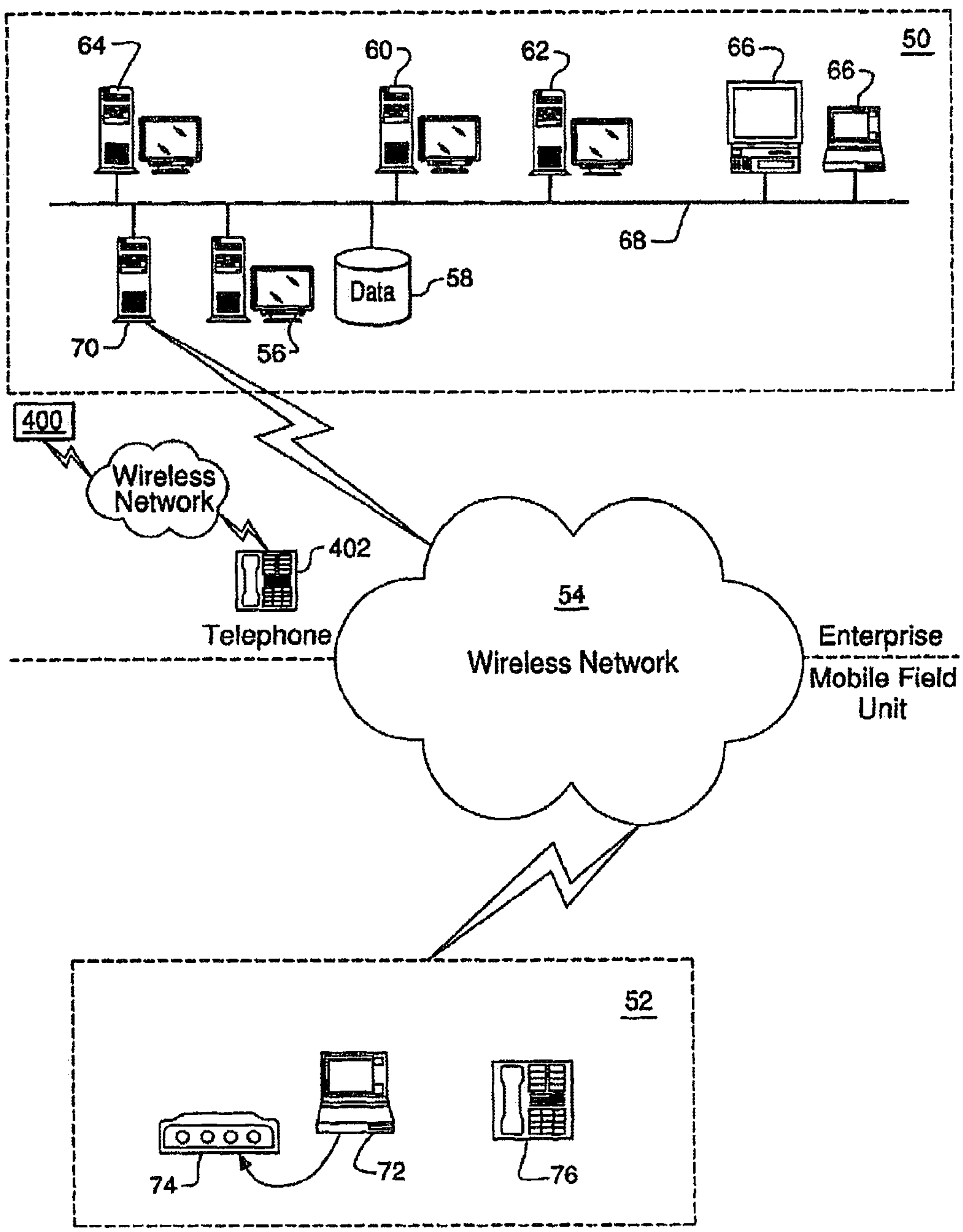

At field unit, transmitting a request to the enterprise computing system for data
200
At the enterprise computing system, in response to the request from the mobile unit. retreiving the map file
202
Transmitting to the mobile field unit the map file
204
Loading the web browser with the map file
206
Upon activation of a map link, requesting from the enterprise computing system, secondary map data
208
At the enterprise computing system, retrieving the secondary map data
210
Transmitting the secondary map data to the mobile field unit
212
Loading the secondary map data in the web browser
214
Transmit request to update data
216
Update data in database
218

FIG. 16



64
60
62
66
66
50
68
Data
58
70
56
400
Wireless Network
402
Telephone
54
Wireless Network
Enterprise
Mobile Field Unit
52
74
72
76


FIG. 17

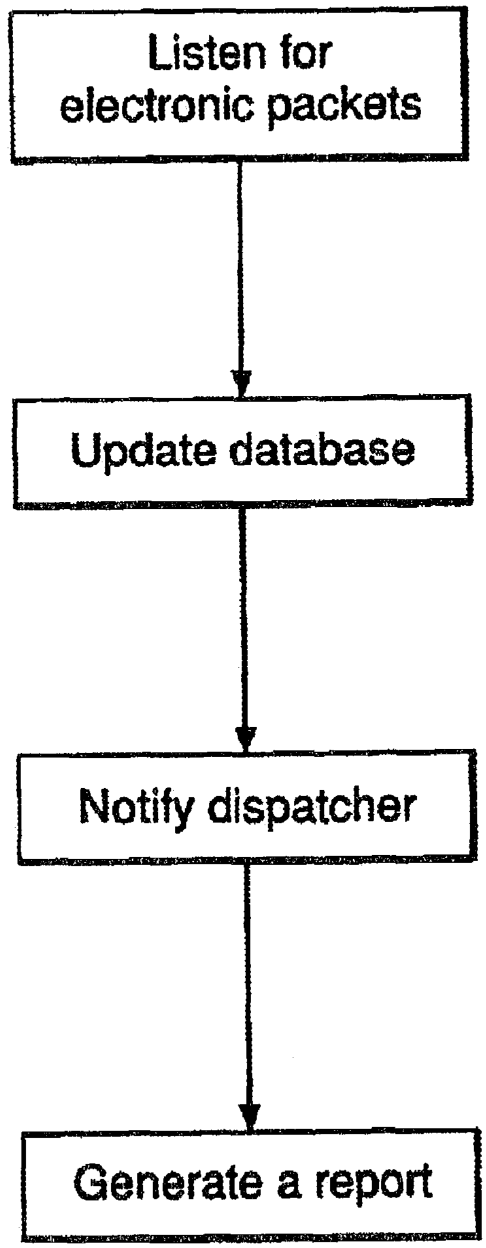

Listen for electronic packets
Update database
Notify dispatcher
Generate a report

FIG. 18

# MOBILE CREW MANAGEMENT SYSTEM FOR DISTRIBUTING WORK ORDER ASSIGNMENTS TO MOBILE FIELD CREW UNITS

## CROSS-REFERENCE TO RELATED APPLICATIONS

This patent is a national phase filing of PCT Patent Application PCT/US99/00497 filed Jan. 8, 1999.

## FIELD OF THE INVENTION

This invention relates generally to management information systems and more particularly to automated systems and methods for work order assignment and field communication.

## BACKGROUND OF THE INVENTION

Businesses such as utility companies which deploy numerous employees over a wide geographic area to service a dispersed infrastructure or client base are faced with the particularly cumbersome task of communicating work assignments and related data to personnel that are dispersed in the field. For example, a utility company is faced with the daunting task of maintaining an infrastructure that spans a potentially very large geographic area. When outages occur in a utility grid, field personnel must be dispatched to address the problem. Typically, field personnel are already in the field when new service tasks or work orders are generated. Thus, utility companies are faced with the very complex task of receiving work orders, identifying field personnel that are best suited for the job as dictated by training, experience, and proximity to the work area, and communicating to field personnel that a particular work order has been assigned to them. In response, field personnel must communicate to the dispatching operator an acceptance or rejection of the work order. Furthermore, if a work order is accepted, it may be necessary to gather information and data regarding the work order. Such data may include for example the type of equipment that is to be serviced, the maintenance history of the particular equipment item, and information regarding other equipment in close proximity. Upon completion of the work order, field personnel are responsible for updating the central office with information on the status of the work order as well as any changes that may have been made to the infrastructure as a result of the work order. Of course other types of organizations such as delivery companies, facilities maintenance companies, and any other types of organization which must assign work and communicate data regarding those assignments to personnel already deployed in the service area are faced with similar problems.

Generally, field personnel and centralized dispatching operations communicate by two-way voice systems such as wireless phone or radio. Such systems allow for communication of voice and in some cases, with the advent of fax machines, data. But by either voice of fax, the amount and type of information that can be easily communicated to field personnel is limited. Indeed, while all of the relevant data necessary for completing a task may be located in a central office, very little of it can be communicated to field personnel. For this reason, field personnel carry with them information resources such as maps and data sheets. Unfortunately, these often quickly become outdated which can lead to a dangerous work environment for field personnel.

Of course, systems have previously been developed to facilitate work assignment and data communication. These systems, however, have used proprietary technology. Further, maintenance of prior systems typically has required manually updating individual nodes of the system through non-network means.

Although these existing systems are useful, there is a need for more advanced two way data communication between field personnel and a central office. In particular, there is a need for a system whereby tasks can be assigned and automatically communicated to field personnel with little or no dispatcher intervention. Field personnel should be able to access on-line the most up-to-date data related to the work order. Additionally, there is a need for a system whereby field personnel are able to update system records to reflect physical changes resulting from their work as well as update system records to reflect changed work order status. Furthermore, such a system should use non-proprietary technologies and be easily maintained.

## SUMMARY OF THE INVENTION

Briefly, the present invention provides a system for assigning work orders, communicating work orders to deployed field personnel, and communicating at the request of field personnel, up-to-date data related to an assigned work order. The system comprises an enterprise computing system, a mobile field unit, and wireless communication network which supports terminal control protocol/internet protocol (TCP/IP). The enterprise computing network comprises application programs through which work orders may be assigned and managed, various server machines containing data related to the work orders, a local area network (LAN) connecting the server machines, and a gateway to the TCP/IP wireless network. A mobile field unit comprises a computing device and modem for communicating over the wireless network to the enterprise computing system. A mobile field unit and each machine in the enterprise computing system has a unique IP address assigned to it. Accordingly, commands and data can be communicated freely between all machines.

According to another aspect of the invention there is provided a method for managing work order assignments. There is also disclosed a method for distributing map data. According to still another aspect of the invention there is provided a method for monitoring communications in the system.

## BRIEF DESCRIPTION OF THE DRAWINGS

Other features of the invention are further apparent from the following detailed description of presently preferred exemplary embodiments of the invention taken in conjunction with the accompanying drawings, of which:

FIG. **1** is a schematic diagram of a system in accordance with the present invention;

FIG. **2** is a diagram of software components of a system in accordance with the present invention;

FIG. **3** is a flow diagram of process in accordance with the present invention for assigning a work order to a field crew;

FIG. **4** is diagram of software components and data flows in a system in accordance with the present invention;

FIG. **5** is a flow diagram of a process in accordance with the present invention for distributing work order assignment data to a field crew having a mobile field unit;

FIG. **6** is a flow diagram of a process in accordance with the present invention for notifying the field crew of an assignment;

FIG. **7** is a flow diagram of a process in accordance with the present invention for verifying the field crew identity;

FIG. **8** is a flow diagram of a process in accordance with the present invention for notifying the field crew of a successful login;

FIG. **9** is a flow diagram of a process in accordance with the present invention for retrieving and presenting a list of assignments to the field crew;

FIG. **10** is an illustration of an exemplary screen showing a list of work order assignments that have been assigned to a field crew;

FIG. **11** is an illustration of an exemplary screen for displaying detailed assignment data;

FIG. **12** is a flow diagram of a process in accordance with the present invention for retrieving detailed assignment data for a selected assignment;

FIG. **13** is an illustration of an exemplary screen for entering data related to the cause of an outage;

FIG. **14** is a flow diagram of a process in accordance with the present invention for updating assignment data in response to an action taken by a field crew;

FIG. **15** is an illustration of an exemplary screen for displaying map data;

FIG. **16** is a flow diagram of a process in accordance with the present invention for gathering and displaying map data;

FIG. **17** is a schematic diagram of a system in accordance with the present invention in communication with a paging system and a digital personal communication system; and

FIG. **18** is a flow diagram of a process in accordance with the present invention for monitoring work order assignment.

## DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

The present invention provides a multi-crew management system. More particularly the management system is an automated system for the distribution of work orders and related materials to field personnel dispersed over a wide geographic area. A work order, which may be any type of description of a particular task, are assigned using a centralized enterprise computing system and are communicated over a wireless network to field personnel having mobile computing units. Field personnel can use a mobile field unit to access the enterprise computing system and gather information about the work order as well as to update the enterprise computing system with details regarding the status of the work order. Thus, a system in accordance with the present invention provides two-way communication and work order automation with minimum dispatcher/operator interference.

FIG. 1 graphically depicts a system in accordance with the invention. As shown, the inventive system comprises enterprise computing system **50**, mobile field unit **52**, and wireless communication network **54** operably connecting the two.

Enterprise computing system **50** may comprise database servers **56** for fielding requests to data stored in database **58**, hypertext transfer protocol (HTTP) servers **60** for fielding requests for web page data, monitoring server **62** for accepting and providing data regarding the status of work orders, and file servers **64**. While each of servers **56**, **60**, **62**, and **64** is represented by a separate machine in FIG. **1**, in some embodiments of the enterprise system a single machine may be configured to perform all of these operations. An enterprise computing system may also comprise workstations **66** from which various application programs may be accessed. Servers **56**, **60**, **62**, and **64** and workstations **66** are interconnected through an Ethernet local area network (LAN) **68**. LAN **68** supports TCP/IP and each of machines **56**, **60**, **62**, **64** and **66** is uniquely identified with an IP address. Gateway **70** provides a communication connection between LAN **68** and wireless TCP/IP network **54**.

In a typical application of the inventive system, enterprise computing system **50** is located at a central office or operations center. As is explained in greater detail below with reference to FIG. **2**, work orders are processed and input to the enterprise computing system using any one of several application programs. Data which field personnel may require to complete their assigned tasks is located on servers **56**, **60**, **62**, and **64** and may be accessed by field personnel using mobile field unit **52**.

Mobile field unit **52** comprises computing device **72** which may be a portable computer, a personal digital assistant (PDA), or similar device. Typically computing device **72** comprises random access memory (RAM), web browser software for internet and intranet communications, and an interactive display mechanism. Computing device **72** may also include: storage capability (flash or electromechanical), a serial interface, an audio playback device, and software to support a TCP/IP protocol stack and point-to-point protocol (PPP).

Mobile field unit **72** may also comprise wireless radio modem **74**. Wireless radio modem **74** provides a means for communicating over wireless network **54** between computing device **72** and enterprise computing system **50**. Wireless radio modem **74** supports PPP protocol and TCP/IP protocol over wireless radio network **54**. Wireless radio modem **74** may be internal or external to computing device **72**.

Mobile field unit **52** optionally may comprise a wireless two-way voice communication device **76**. Device **76** may be integrated with computing device **72** or may be a separate radio device, cellular phone, or digital cellular phone.

Each field crew is assigned a mobile field unit **52**. Thus, although only one is shown in FIG. **1**, numerous mobile field units **52** may be deployed and operating at once. As noted, each mobile field unit **52** has an IP address assigned to it. Further, enterprise computing system **50** comprises a database of entries indicating for each field unit, the field crew which has the unit. Thus, when a work order is assigned to a particular field crew, the inventive system automatically routes the appropriate commands and data as described below to the appropriate mobile field unit **52**. Field crews are free to access enterprise computing system **50** to gather data that may be helpful in completing the assigned work order.

Wireless radio network **54** provides TCP/IP communication between enterprise computing system **50** and mobile computing device **52**. As previously noted, each mobile field unit **52** is given a unique IP address. Similarly, machines on enterprise computing network **50** are given a unique IP. Because wireless radio network **54** supports TCP/IP, routing of data and commands between mobile field units **52** and enterprise computing system **50** can be accomplished by existing network techniques. Further, mobile field units **52** can be arranged into various network configurations such as subnets and intranets and in theory, if the appropriate gateways are arranged, can be accessed via the Internet.

IP addressing allows for commands to be routed to, and data accessed from any machine in the network. Thus, data and/or a command may be transmitted via gateway **70** to wireless radio network **54** and delivered at any particular mobile field unit **52**. Similarly, data and/or a command may be transmitted from mobile computing device **52** via modem **74** to wireless network **54** which delivers the data and/or command to a particular machine designated by a unique IP address on enterprise computing system **50**.

Preferably, wireless network **50** employs native TCP/IP. However, any network type may be employed provided it can be adapted to support TCP/IP. Thus, wireless network **54** may be any of the following network types: a CDPD public network (packet-switched); a radio packet-switched network (adapted for TCP/IP); a tariff/non-tariff-based network; or a Personal Communication Systems network(circuit-switched). A system in accordance with the invention can be implemented at any location that one of these network types exists.

Cellular Digital Packet Data (CDPD) is an open standard public network. In one embodiment of the present invention, modem **74** is a CDPD modem which is assigned a unique **32** bit IP address. The IP address becomes the unique identifier associated with mobile field unit **52**.

Typically, where CDPD networking technology is employed, network connection between mobile field unit **52** and enterprise computing system **50** can be maintained continuously. Thus, with a CDPD communications network, the connection between the enterprise system **50** and mobile field units **52** does not require call setup or dial-in/dial-out specifications. The transfer of data between enterprise system **50** and mobile field unit **52** is immediate or within seconds via a virtual TCP/IP circuit which maintains continuous two-way traffic across the CDPD packet-switched data system. Any data packet originating from either the enterprise system **50** or mobile field unit **52** is delivered almost immediately.

In an alternative embodiment, wireless network **54** may be a Personal Communications System (PCS) network. With a cellular network the communications can be either digital or analog across a circuit-switched data system. In a circuit-switched data system the connection between enterprise computing system **50** and mobile field unit **52** must be established via an initiation call. Thus, call setup and dial-in dial-out specifications are required to deliver or receive data. When a call is complete, the TCP/IP circuit is terminated and communication between enterprise system **50** and the mobile field unit **52** is unavailable. In an embodiment of the present inventive system where PCS communication is employed, analog modems may be deployed in both enterprise computing system **50** and mobile field units **52**. The analog modems convert modulated digital data to be translated over the voice band of a cellular phone.

In still another embodiment of the present invention, wireless network **54** may comprise a radio (wireless) packet-switched network which does not support TCP/IP. Like TCP/IP-based CDPD communications, radio packet-switched networks can transmit and receive packet data anytime without call setup. These networks include both public proprietary data networks (e.g., ARDIS and RAM) and private radio networks (e.g., DATA TAC). However, because the inventive system relies upon TCP/IP, in order to employ such networks it is necessary to use third party equipment such as that provided by PADCOM Incorporated to allow such a network to support TCP/IP.

Enterprise computing system **50** and mobile field unit **52** comprise various software components. FIG. **2** is a diagram of software components comprised in a system in accordance with the present invention. As shown, in enterprise computing system **50**, numerous application program components or clients **80** may exist. Preferably these are written using the JAVA programming language so as to be operable on platforms running various operating systems. Each application **80** may serve a particular purpose with respect to managing work orders and monitoring the progress of those work orders. It should be noted that there may be multiple instances of the same application **80** running at any one time. Furthermore, remote applications **81** from outside system **50** may also occasionally access system resources.

Enterprise computing system **50** also comprises database server software **82** which may be, for example, an Oracle database server. Indeed, there may be multiple databases **82** in one system **50**. Database server software **82** manages work order data as well as other business related data. For example, in the case of a utility, databases **82** might comprise detailed equipment data and map data.

Enterprise computing system further comprises HTTP servers **84** which may be, for example, a Netscape or Apache HTTP server. HTTP servers **84** are operable to field requests from all machines but particularly from web browsers located in mobile field unit **52**. HTTP servers **84** are operable to launch or invoke stored procedures or common gateway interface programs (CGI) to implement actions initiated by field crew members at mobile field unit **52**. The CGI is a mechanism which allows data to be transferred from a browser to a program residing on the server via the HTTP server such that the program processes the data (usually parameters) and can deliver results back to the browser via the HTTP server. It should be noted that by invoking stored procedures it is meant that HTTP server **84** which has been delivered the name of a stored procedure within a database, can cause the stored procedure to execute via an intermediate program passing it parameters. The stored procedure can generate data which it can deliver to a program such as a web browser via HTTP server **84**. The stored procedure typically accesses database tables.

Monitor server software **85** accepts updates from applications **80** indicating that a work order has been assigned. Monitor server software **85** also accepts updates as to whether the work order was received at field unit **52** and whether it was accepted by the field crew. Monitor server **85** also provides a report generation feature.

Mobile field unit **52** comprises mobile server application **86**. Mobil server application **86** services requests from enterprise computing system **50** to mobile field unit **52**. In a preferred embodiment, mobile server **86** is written in the JAVA programming language which allows for mobile server **86** to run on numerous hardware platforms running various operating systems such as Windows, Mac OS, or Unix. Mobile server **86** is multi-threaded meaning it listens for requests and upon receipt of an input, spawns process **88** to react to the input. In this way, mobile server **86** can continue to listen for additional requests.

Mobile field unit **52** also comprises web browser **90** which may be loaded with files **92** that are downloaded from enterprise computing system **50**. Web browser enhancer **94** is loaded by web browser **90** to display maps and related data. Web browser enhancer **94** may be a plug-in that is initially stored on mobile field unit **52**. Alternatively, web browser enhancer **94** may be an Applet that is downloaded from enterprise computing system **50**.

Typically operations in a system in accordance with the present invention are initiated at one of application programs **80**. For .example, a work order may be assigned to a particular field crew using application program **80**. FIG. **3** is a high-level flow chart of the process of making a work order assignment to a field crew having a mobile field unit **52**. Generally, an operator at enterprise computing system **50** employs application program **80** to assign a work order or task to a particular field crew. As shown, at step **110** an entry indicating that a work order or task has been assigned to the

field crew is entered in database **82**. At step **112** data file **92** related to the work order along with a command to launch a web browser are transmitted to field unit **52**. At step **114** mobile field unit **52** launches web browser **90** and loads web browser **90** with data file **92** which causes a web page to be displayed. In response to input from field personnel such as pointing and clicking on links in the displayed web page, at step **116** mobile field unit **52** transmits to enterprise computing system **50** a request for additional data regarding the work order. At step **118** enterprise computing system **50** retrieves the requested data, usually in the form of a data file. At step **120** the retrieved data is transmitted to mobile field unit **52**.

FIG. **4** depicts various command and data flows that may be implemented in a system in accordance with the present invention when a work order is assigned to a field crew. Typically, work orders are assigned by personnel at enterprise computing system **50** using application program **80**. In response, application program **80** requests, as represented by arrow **140**, that database **82** be updated to reflect that the work order has been created. Generally, when a work order is created it is assigned a unique identifier in database **82**. Thereafter, application program **80** establishes a TCP/IP connection with mobile server **86** and transmits a command to mobile server **86** (arrow **142**). Simultaneously, a command may be issued (arrow **144**) by application program **80** to database **82** directing the generation of map related data corresponding to the work order.

In one embodiment, the map related data comprises two files of mapping data. A first file **146** is in ASCII format and comprises map data in vector format. Typically the file is given a name ending in .mpx. The file extension .mpx identifies the file as a MIME type. As explained below, upon receipt of a file with the .mpx extension, web browser **90** is programmed to load plug-in **94** and display the map data contained therein in a map area of web browser **90**. .Mpx file **146** comprises unique identifiers for select objects that are displayed on the map. For example, a unique device identifier for a transformer may be included in .mpx file **146**. Using these unique identifiers, when a crew member clicks on an object in the map, detailed data regarding the particular device can be retrieved from database **82**.

An exemplary portion of ".mpx" file **146** is listed below:

```
5 18 1075553 1082844 0 U36864 36864
5 18 1071543 1082969 0 U27824 27824
5 18 1072568 1083014 0 U27825 27825
5 18 1076096 1084066 0 U27826 27826
5 18 1082774 1084547 0 U27829 27829
5 18 1077940 1085438 1 U27828 27828
```

According to a preferred embodiment of the invention, each line in ".mpx" file **146** represents a map object to be displayed. Each line is formatted into seven columns. The first column designates the map object type. For example, type 5 represents an electrical network object. The second column identifies the type of electrical network object. For example, an electrical object may be a fuse transformers. The third and fourth columns represent the state plane coordinates of the object. The fifth column represents the state of the device, for example, open or closed. The sixth column identifies the unique device identifier. This unique identifier when combined with the uniform resource locator parameter which as explained below is stored in file **148**, allows mapping plug-in **94** to request more detailed data regarding a selected device as well as change the state of the device. The seventh column is an identifier used to speed up the device lookup process.



A second file **148** is generated and formatted in HTML. HTML file **148** contains parameters which are used to configure plug-in **94**. A first parameter sets the uniform resource locator (URL) for HTTP server **84** and the specifies the common gateway interface (CGI), or alternatively the stored procedure, which should be invoked when a user clicks on a device or map object that is displayed on the map. A second parameter enables or disables the ability for a crew to obtain information about an object. Other parameters control the display of the land base map data as well as control other settings.

An exemplary html file **148** is listed below:

```
<HTML><HEAD>
<TITLE>MAP Plugin</TITLE>
</HEAD>
<BODY>
<H3>CADOPS Plugin </H3>
<EMBED SRC="5979_map.mpx" device_url="http://
  abb.vnet.net/ast/owa/getobj dl" enable_mobile_
  cadops=1 fixed=1 width=750 height=450 minx=
  1068940 miny=1076438 maxx=1086940 maxy=
  1094438 curvetype="map"></EMBED>
<H5>outage: 5979</H5>
<H3>CADOPS-WEBMAP </H3>
<H45>ABB Distribution Information Systems, all rights
  reserved co1998</H45>
</BODY>
</HTML>
```

In the above example, the object URL is specified by the "device_url" parameter. Note that the EMBED tag specifies the ".mpx" file **146** as 5979_map.mpx. This file is delivered to web browser **90** and ultimately to plug-in **94** for display.

The unique identifier for the work order to which the map data relates is embedded in the names of both files **146** and **148**. This facilitates the later retrieval of these files. Application program **80** also requests that monitoring server **85** update records in database **82** to indicate that a particular work order has been transmitted to mobile unit **52** (arrow **150**).

At mobile field unit **52**, mobile server **86** spawns (arrow **152**) process **88** to respond to the command from application program **80**. In response to a command that a new work order has been assigned to the field crew, process **88** may cause an alert sound to be broadcasted (arrow **154**). Thereafter or simultaneously, an alert message may be automatically displayed on the display of the mobile field unit **52** (arrow **156**) to further alert the field crew. Process **88** launches web browser **90** (arrow **158**) and loads web browser **90** with data, usually in the form of an HTML file **92** that was downloaded from application program **80** with the initial command.

Typically, downloaded html file **92** which is displayed in web browser **90** has web links to data stored in enterprise computing system **50**. Thus, when field crew personnel click on a link in web browser **90**, a request, preferably in the form of a HTTP post or get command (arrow **160**) is made of HTTP server **84** in enterprise computing system **50**. In response, HTTP server **84** queries, preferably by way of a stored procedure (arrow **162**) database **82** for the requested data. Database **82** returns (arrow **164**) the requested data to HTTP server **84**, and HTTP server transmits **84** (arrow **166**) the requested data to web browser **90**. In a preferred embodiment, database **82** returns the data in HTML format.

FIG. **5** provides a flow chart depiction of a scenario for using the system of FIGS. **1** through **5** to distribute work

order assignment data to a field crew having a mobile field unit. As shown, at step **300** database **82** is updated using application program **80** to indicate a work order has been assigned to a particular field crew. At step **302** the field crew is notified of the assignment via mobile field unit **52**. In response to login data input by the field crew, at step **304** the identity of the field crew is verified against database **82** of enterprise computing system **50**. At step **306** a notification is made to the field crew via field unit **52** if the login was successful. At step **308** a list of assignments is retrieved and presented to the field crew. At step **310** in response to input by the field crew selecting an assignment from the list of assignments, detailed assignment data for the selected assignment is retrieved from database **82**. At step **312** the detailed assignment data is displayed to the field crew via mobile field unit **52**. At step **314** in response to field crew input identifying that an action was taken with regard to the assignment, the detailed assignment data is updated in database **82**.

FIG. **6** provides a detailed flow chart of step **302** of FIG. **5** for notifying the field crew of the assignment. As shown at step **320** an "alert HTML page" is generated at the enterprise computing system in response to the assignment being assigned to the particular field crew. At step **322** the "alert HTML page" and a command to open a browser is transmitted from enterprise computing system **50** to mobile field unit **52**. At step **324** web browser **90** is launched in response to the command and the "alert HTML page" is loaded into web browser **90**.

FIG. **7** provides a detailed flow chart of step **304** of FIG. **5** for verifying the field crew identity. At step **330** in response to a field crew member clicking on a link in the "alert HTML file," a login form is displayed. It should be noted that this link and the others that are described herein may comprise a URP and point to a specific application, for example a CGI or stored procedure which should be executed in response to clicking upon the link. The link may cause data, including web pages, to be retrieved from or updated in enterprise computing system **50**. At step **332** in response to the field crew entering login data into the login form and submitting the login data, the login data is transmitted to enterprise computing system **50**. At step **334** database **82** is queried to verify that the login data is correct.

FIG. **8** provides a detailed flow chart of step **306** for notifying the field crew of a successful login. At step **340** of FIG. **8**, a "success HTML page" indicating there has been a successful login is generated at the enterprise computing system. At step **342** the "success HTML page" is transmitted to the mobile field unit **52**. At step **344** at enterprise computing system **50** a cookie is generated. The cookie contains data related to the field crew such as a unique field crew identifier. The cookie remains resident for a selected period of time so that upon subsequent accesses to the enterprise computing system **50** by the same field crew during the selected period of time, the field crew does not need to login again. Any programs, for example stored procedures which may require data such as the field crew identifier can obtain that information from the cookie. The cookie may be generated by a CGI that was initiated by HTTP server **84**. At step **346** the "success HTML page" is displayed at mobile field unit **52** using web browser **90**. The "success HTML page" has a "continue link" therein for continuing with the assignment distribution process.

FIG. **9** provides a detailed flow chart for step **308** of FIG. **5** for retrieving and presenting a list of assignments to the field crew. At step **350**, at mobile field unit **52**, in response to a field crew member clicking on the "continue link" in the "success HTML page," a request is transmitted for a list of assignments. At step **352** at the enterprise computing system **50**, database **82** is queried for assignments that have been assigned to the field crew. The field crew identifier, which may be retrieved from the cookie, is used in performing the query. At step **354** at enterprise computing system **50**, an "assignment HTML page" is generated containing data comprising a list of assignments that have been assigned to the particular field crew. The "assignment HTML page" may be generated by a common gateway interface or a stored procedure invoked by an HTTP server. The "assignment HTML page" has "assignment links" to additional data in the database corresponding to each assignment. Each "assignment link" contains a unique identifier for the assignment which may be used in retrieving the additional assignment data from database **82**. These "assignment links" may comprise a uniform resource locator (URL) for the server and program on enterprise computing system **50** that should be executed in order to retrieve the desired data. At step **356** the "assignment HTML page" is transmitted to the field crew via mobile field unit **52**. At step **358** the "assignment HTML file" is loaded into web browser **90**. FIG. **10** provides an exemplary screen of the type that may be displayed upon loading of the "assignment HTML page" into web browser **90**.

FIG. **12** provides a detailed flow chart corresponding to step **310** of FIG. **5** for retrieving detailed assignment data for the selected assignment. As shown, at step **360** at the mobile field unit **52** in response to a crew member clicking on an "assignment link" in the assignment HTML page, a request for data related to the selected assignment is transmitted to enterprise computing system **50**. At step **362** at the enterprise computing system **50** the database **82** is queried for assignment data related to the selected assignment. At step **364** at enterprise computing system **50** a "detailed assignment data HTML page" is generated. The "detailed assignment data HTML page" contains detailed data regarding the assignment that was selected previously by the field crew. An example of a displayed screen corresponding to a "detailed assignment data HTML page" is shown in FIG. **11**. The "detailed assignment data HTML page" contains a plurality of "HTML status links" each of which when clicked upon causes a different action to be taken relative to the data in database **82** that tracks the status of the particular assignment. "HTML status links." may contain a uniform resource locator and program name that implements the desired action in database **82**. For example, one of the plurality of links may be an "accepted link" which when clicked upon causes the status data in the database to indicate the assignment has been accepted. One of the plurality of links might be an "enroute link" which when clicked upon causes the status data in the database to indicate the crew is enroute to the assignment location. A link might be a "completed link" which when clicked upon causes the status in the database to indicate the assignment has been completed. A link may be a "rejected link" which when clicked upon causes the status data in the database to indicate the assignment has been rejected by the field crew. A link may be an "arrived link" which when clicked upon causes the status data in the database to indicate the field crew has arrived in the assignment location. Still another link may be a "cancel link" which when clicked upon causes no change to the status data in the database but which may close the web page. It should be noted that the "detailed assignment data HTML page" may contain other links. For example, a "refresh link" may be available which when clicked upon causes the data on the page to be updated.

The "detailed assignment data HTML page" may also comprise a "cause locator" link. When the "cause locator" link is clicked upon, a CGI or stored procedure via HTTP server **84** is executed which generates a "cause HTML form." When the "cause HTML form" is delivered to the web browser, a cause/equipment pop-up menu is displayed. FIG. **13** provides a view of an exemplary "cause HTML form" when displayed. This form allows field crew members to indicate the type of equipment that was damaged and the potential cause for the damage. The items listed in the cause or equipment categories are derived by querying database **82** on enterprise computing system **52**. Thus, the items listed are not pre-loaded on the mobile field unit but are dynamically updated to fit the particular work order assignment. The "cause HTML form" also provides for the entry of related time information. In particular the form allows for entry of an estimated restore time and an estimated arrival time. When the mobile field crew completes and submits the "cause HTML form" the data is transferred to database **82**. The database may be made available to a customer information system (CIS). Thus, customers may access the CIS and receive immediate notification of restore time. By this system and method, human element in communication is eliminated. The data is passed directly to the customer.

At step **366** the "detailed assignment data HTML page" is transmitted to mobile field unit **52**. At step **368**, which corresponds to step **312** of FIG. **5**, the "detailed assignment data HTML page" is loaded and displayed in web browser **90**.

FIG. **14** provides a detailed flow chart for step **314** of FIG. **5** for updating the "detailed assignment data" which is detailed data regarding the assignment that a field crew may be working on. At step **370** at mobile field unit **52** in response to crew input as to the status of the assignment, updated "detailed assignment data" is transmitted to enterprise computing system **50**. At step **372** at enterprise computing system **50** the "detailed assignment data" is updated in database **82** to reflect the change. At step **374** the dispatcher is alerted as to the change in status of the assignment. The alert may be a notification sound and/or a visual notification such as a dialog box.

It should be noted that in the processes described with reference to FIGS. **6** through **13**, stored procedures may be used at the initiation of HTTP server **84** to query the database and take other actions with respect to the steps described above. Furthermore, a common gateway interface (CGI) script may alternatively be initiated by HTTP server **84** to perform many of these same operations. An HTTP server **84** and stored procedure/CGI for taking some action relative to the data in database **82** may be identified by a uniform resource locator that is stored in a web page link. The (CGI) script may be written in the PERL scripting language and may access database **82** using PERL database interface (DBI) and/or PERL database driver (DBD). Based upon the queries to the database, the PERL script can generate HTML on the fly and deliver it to a field crew's web browser **90** via HTTP server **84**. The PERL script can also update database records via DBI/DBD.

For many work orders, a sub map of the assignment area can be of great value. For example, when responding to a power outage, a map can show both the land base and electrical network. The state of the electrical network and exact location of outages and faults can be shown on the mar. Furthermore, according to the present invention, a crew member can click on objects in a map and obtain additional detailed information from enterprise computing system regarding that object.

Referring back to FIG. **4**, a field crew member may request map data of the work order work area by clicking on a button or appropriate link displayed on web browser **90**. Requests for map data are transmitted (arrow **168**) to HTTP server **84** and include the unique identifier of the work order. Using this work order identifier, HTTP server requests (arrow **170**) and receives (arrow **172**) the map files **146** and **148** that were previously developed and whose names include the work order identifier. HTTP server **84** transmits (arrow **174**) the map data to web browser **90**. When web browser **90** receives and loads HTML file **148**, it encounters a link to .mpx file **146**. The link to file **146** signals web browser **90** to load plug-in **94** (arrow **176**) and display the map data composed in .mpx file **146** in a map area of web browser,**90**. An exemplary screen with a map area of the type which might be displayed in web browser **90** is shown in FIG. **15**.

It should be noted that plug-in **94** can capture via web browser **90** all point and click events within the window area generated by the plug-in. This is important for handling requests for data on objects displayed in the map. Further, plug-in **94** is operable to execute an HTTP post or get command to HTTP servers **84** in enterprise computing system **50**. Also, plug-in **94** maintains a linked list of all map objects displayed in the map along with the unique identifiers for those objects. Thus, when a map object is clicked upon, the unique identifier for the object is readily retrieved from the linked list.

Generally, the crew is free to interact with the map and obtain more information about the objects on the map by simply clicking on the particular map object. For example, a crew member may click on a transformer to obtain more information about the transformer. By clicking on the transformer, a new browser window is launched with a new HTML page comprising additional information regarding the transformer. For example, the new page may contain the make and model of the transformer as well as the maintenance history of the transformer. The new page may contain links to even further information regarding the transformer. For example, the HTML page may contain links to all network information about transformers of the same type and make. Directions to the transformer might also be displayed.

Generally, when a crew member clicks on a map object, plug-in **94** obtains the click event and the device coordinates of the point which was clicked upon. Plug-in **94** transforms the device coordinates to user coordinates (such as state plane coordinates) and searches for the nearest map object within its linked list to the point which was clicked. A dialog box is presented to the crew with the unique identifier for the device which corresponds to the map object selected. The crew is given the choice to request more information or to cancel the dialog. If the crew selects to see more detailed information, plug-in **94** retrieves the URL including the CGI that it obtained as a parameter from html file **148**. Note that because the URL and CGI are parameters in html file **148** which is downloaded from enterprise computing system **50**, the URL is not hard-coded on mobile field unit **52** and can vary by the map that is displayed. Indeed, different map files **146** and **148** may point to different resources at enterprise computing system **50**.

Plug-in **94** attaches the unique object ID for the selected map object to the URL and CGI and submits an HTTP post or get command to HTTP server **84**. Server **84** delivers the object ID to the CGI or database stored procedure. In either case, the program queries database **82** and generates an HTML file on the fly to be displayed in a new window in the

crew's browser **90**. The HTML may be a form or can contain links so that the crew can obtain further information. A link may also allow a crew to update the data related to a map object. For example a link may allow a field crew to indicate that a device corresponding to map object has been repaired, replaced, closed, opened, or removed. The ability to update the data in database **82** on-line greatly reduces paper work and provides for accurate and up-to-date records.

FIG. **16** provides a flow chart of the process of gathering and displaying the map data in the present invention. As shown, at step **200** in response to a field crew member requesting a map for a particular work order, a request is transmitted from web browser **90** to HTTP server **84**. At step **202** HTTP server **84** uses the work order identification number to retrieve map data corresponding to the work order. As noted above, in one embodiment of the invention, map data comprises two files, one in HTML format and one in an ASCII format. These files may contain links to secondary map data which comprises further information about objects composed in the map. At step **204** the map data is transmitted to web browser **90**. At step **206** web browser **90** loads the map data, possibly using plug-in **94** so as to display a map to the crew personnel. In response to crew personnel clicking on a map object located in the displayed map, at step **208** web browser **90** transmits a request to HTTP server **84** for secondary map data related to a particular item on the map. At step **210** HTTP server **84** transmits a request to database **82** for the additional data. Database **82** processes the request and returns the requested data to HTTP server **84**. HTTP server **84** transmits the secondary map data to web browser **90** at step **212**. Web browser **90** loads the data in a browser window at step **214**. It should be noted that the secondary map data may comprise an HTML file comprising a plurality of links for retrieval of still additional information or even updating data. This HTML file may be referred to as a "secondary map data retrieval file."

As noted above, field crews may change the physical equipment located in the field. According to the present invention, the field crew may also change the data in the system to reflect any changes that may have been made to the physical network. Thus, the field crew may enter data at web browser **90**, possibly using the "secondary map data retrieval file." Thus, at step **216**, the web browser transmits to HTTP server **84** a request to update database **82** in enterprise computing system **50**. At step **218**, HTTP server **84** forwards the request to database server **82** which updates the data to reflect the changes made by the field crew.

Another feature of the present invention involves monitoring of the assignment of work orders. When a work order is assigned to a field crew, the application through which the work order is being assigned not only connects to mobile field unit **52** but also transmits a packet of data to monitoring server **64** which comprises monitoring server software **85**. Monitoring server **85** is updated to indicate whether a connection was successfully established with mobile server **86**. A connection may not be established, for example, if mobile field unit **52** is out of range of wireless network **54**. Monitoring server **85** stores an indication of whether a transmission was successful or not in database **82** or alternatively in a system file. Monitor server **85** may also send a notification, preferably via e-mail to a supervisor or dispatcher if a work order failed to successfully transmit to field unit **50**. As shown in FIG. **17**, enterprise computing system might also be connected to a paging system **400** and/or a digital personal communication system **402**. Thus, notification of a transmission failure may also be sent to a dispatcher from monitoring server by a page or a message via the PCS system. The notification step is necessary so that the dispatcher can resort to alternative means for communicating with the desired field crew. Applications can query the monitoring database **82** to obtain reports on the state of assignments (failures or acceptance) and to also obtain reports on the state of the wireless network.

FIG. **18** provides a flow chart of a method for monitoring work order assignment. At step **220**, the server listens at specified internet protocol address for electronic packets comprising the status of the transmission of a work order to the mobile field unit. Generally, the electronic packets comprise a unique identifier for the work order, an indication of the time the status was recorded, and the internet protocol address of the relevant mobile field unit. Monitor server may be configured to receive either UDP or TCP packets. At step **222** an entry is made in database **82** indicating whether or not the work order has been successfully been transmitted. At step **224** the dispatcher is notified if the transmission was not successful. Upon receipt of a request for a report from an application program, at step **226** monitor server **85** processes the request and generates a report which may be transmitted to the requesting application.

It should be noted that there are numerous advantages to the systems and methods in accordance with the present invention. Foremost of these is that propriety code does not need to be developed and deployed on mobile field unit **52**. For example, code for displaying information in a window or in dialog box is not proprietary. Rather, all graphical user interfaces are built using HTML generated dynamically by a CGI or stored procedures at enterprise computing system **50**. Thus, there is no need to write complex closed proprietary code for each mobile field unit **52** when an interface is changed or different data needs to be presented.

Furthermore, in a system in accordance with the present invention application programs **80** generate dynamic HTML based on data and the desired presentation (which can include pop up menus, text fields, check boxes, selection boxes, etc). These dynamically created HTML files are thereafter delivered to the mobile field unit. Thus, changes made at enterprise computing system **50** are reflected immediately at mobile field unit **52**. This greatly facilitates deployment of new user interfaces and applications to large numbers of field units **52**.

Thus, as described above the present invention provides systems and methods for low-cost, timely, two-way communications between a central enterprise systems and geographically distributed field personnel. The system comprises an enterprise computing system, a wireless network, and a mobile field unit. Communications are TCP/IP-based and can be carried over a public or private network using a variety of communications technologies. Communication between the enterprise computing system and the mobile field unit is completely automated (voice communication is the exception). Although this unique system offers operator/dispatch functionality, the need for operator/dispatcher assistance is minimized. In addition, mobile field crews can access information resources at the central operations level including work order and mapped vehicle location data and other pertinent information.

While the invention has been described and illustrated with reference to specific embodiments, those skilled in the art will recognize that modification and variations may be made without departing from the principles of the invention as described above and set forth in the following claims. In particular, the present invention has been explained with reference to an exemplary utility environment but may be

employed in other environments such as maintenance service corporations, ambulance services, public safety systems or any other operation which communicates work orders to field personnel. Accordingly, reference should be made to the appended claims as indicating the scope of the invention.

What is claimed is:

1. A method for distributing work order assignment data to a field crew using a system having an enterprise computing system and at least one mobile field unit, comprising the following steps:

(A) updating a database on the enterprise computing system to indicate an assignment has been assigned to the field crew;

(B) notifying the field crew of the assignment;

(C) in response to the input of field crew login data, verifying field crew identity;

(D) notifying the field crew of successful login;

(E) retrieving and presenting a list of assignments to the field crew;

(F) in response to field crew input selecting an assignment from the list of assignments, retrieving detailed assignment data for the selected assignment;

(G) displaying the detailed assignment data to the field crew; and

(H) in response to field crew input identifying an action was taken with regard to the assignment, updating the detailed assignment data.

2. The method of claim 1 for distributing work order assignment data, wherein the step of notifying the field crew of the assignment further comprises the following steps:

at the enterprise computing system, generating an alert HTML page;

transmitting the alert HTML page and a command to open a web browser to the mobile field unit;

at the mobile field unit, launching a web browser in response to the command and loading the web browser with the alert HTML file.

3. The method of claim 1 for distributing work order assignment data, wherein the step of verifying field crew identity, further comprises the following steps:

at the mobile field unit, upon a field crew member clicking on a link in the alert HTML file, displaying a login form;

at the mobile field unit, in response to a field crew entering login data, transmitting the login data to the enterprise computing system;

at the enterprise computing system, querying a database to verify the login data is correct.

4. The method of claim 1 for distributing work order assignment data, wherein the step of notifying the field crew of successful login, further comprises the following steps:

at the enterprise computing system, generating a successful login HTML page;

at the enterprise computing system, generating a cookie having crew login data including a crew identifier;

transmitting the successful login HTML page to the mobile field unit; and

displaying the successful login HTML page in the web browser at the mobile field unit.

5. The method of claim 4 for distributing work order assignment, wherein the step of generating a cookie is performed by a common gateway interface.

6. The method of claim 4 for distributing work order assignment, wherein the step of generating a cookie is performed by a stored procedure that is invoked by an HTTP server.

7. The method of claim 4 for distributing work order assignment data, wherein the step of retrieving and presenting a list of assignments to the field crew, further comprises the following steps:

at the mobile field unit, in response to a field crew member clicking on a continue link in the successful login HTML page, transmitting a request for a list of assignments;

at the enterprise computing system, in response to the request for list of assignments, querying the database for assignments;

at the enterprise computing system, generating an assignment HTML page;

transmitting the assignment HTML page to the mobile field unit; and

at the mobile field unit, loading the assignment HTML page into the web browser.

8. The method of claim 7 for distributing work order assignment data, wherein said assignment HTML page contains a list of assignments assigned to the field crew and assignment links to additional data in the database corresponding to each assignment.

9. The method of claim 7 for distributing work order assignment data, wherein each of the assignment links contains an assignment identifier for uniquely identifying the assignment.

10. The method of claim 7 for distributing work order assignment data, wherein the step of querying the database for assignments comprises the following steps:

retrieving crew identifier data from the cookie;

querying the database for assignments related to the crew identifier data.

11. The method of claim 7 for distributing work order assignment data, wherein the step of generating an assignment HTML page is performed by a common gateway interface.

12. The method of claim 7 for distributing work order assignment data, wherein the step of generating an assignment HTML page is performed by a stored procedure invoked by an HTTP server.

13. The method of claim 1 for distributing work order assignment data, wherein the step of retrieving detailed assignment data for an assignment in the list of assignments, further comprises the following steps:

at the mobile field unit, in response to a crew member clicking on an assignment link in the assignment HTML page, transmitting a request for data related to the selected assignment;

at the enterprise computing system, querying the database for assignment data related to the selected assignment;

at the enterprise computing system, generating a detailed assignment data HTML page; and

transmitting the detailed assignment data HTML page to the mobile field unit.

14. The method of claim 13 for distributing work order assignment data wherein the assignment data HTML page has a plurality of HTML status links each of which when clicked upon causes a different update to the status data of the assignment in the database.

15. The method of claim 14 for distributing work order assignment data wherein one of said plurality of HTML status links is an accepted link which when clicked upon causes the status data in the database to indicate the assignment has been accepted.

16. The method of claim 14 for distributing work order assignment data wherein one of said plurality of HTML

status links is an enroute link which when clicked upon causes the status data in the database to indicate the crew is enroute to the assignment location.

**17**. The method of claim **14** for distributing work order assignment data wherein one of said plurality of HTML status links is a completed link which when clicked upon causes the status data in the database to indicate the assignment has been completed.

**18**. The method of claim **14** for distributing work order assignment data wherein one of said plurality of HTML status links is a rejected link which when clicked upon causes the status data in the database to indicate the assignment has been rejected by the field crew.

**19**. The method of claim **14** for distributing work order assignment data wherein one of said plurality of HTML status links is an arrived link which when clicked upon causes the status data in the database to indicate the field crew has arrived at the assignment location.

**20**. The method of claim **14** for distributing work order assignment data wherein one of said plurality of HTML status links is a cancel link which when clicked upon causes the status data in the database to not be updated.

**21**. The method of claim **13** for distributing work order assignment data wherein the assignment data HTML page comprises a refresh link which when clicked upon causes all of the data displayed in the assignment data HTML page to be refreshed.

**22**. The method of claim **13** for distributing work order assignment data wherein the assignment data HTML page comprises a cause locator link which when clicked upon causes a cause HTML form to be displayed and into which data may be entered related to the cause of an outage.

**23**. The method of claim **13** for distributing work order assignment data, wherein said step of querying the database for assignment data is initiated by a common gateway interface.

**24**. The method of claim **13** for distributing work order assignment data, wherein said step of querying the database for assignment data is initiated by a stored procedure executed by an HTTP server.

**25**. The method of claim **1** for distributing work order assignment data to field crews using a system having an enterprise computing system and at least one mobile field unit, wherein the step of updating the detailed assignment, further comprises the following steps:

at the mobile field unit, in response to a crew member clicking on an HTML status link in the assignment status HTML page, transmitting updated status data;

at the enterprise system, updating the status data in the database;

at the enterprise system, alerting a dispatcher as to the change in status data.

**26**. The method of claim **25** for distributing work order assignment data, wherein the step of alerting a dispatcher as to change in status data comprises generating a sound to draw the attention of a dispatcher to the change in status data.

**27**. The method of **25** for distributing work order assignment data, wherein the step of alerting a dispatcher as to change in status data comprises generating a dialog box to draw the attention of a dispatcher to the change in status data.

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